POPULAR MECHANICS

CONCRETE

POPULAR MECHANICS PRESS
CHICAGO

POPULAR MECHANICS

CONCRETE

HANDBOOK No. 1

Practical plans for using concrete
about the home, farm or shop.
A book for amateurs as
well as contractors

REVISED AND ENLARGED

POPULAR MECHANICS PRESS
CHICAGO

Printed in U. S. A.

How to Make Good Concrete

UNTIL the recent discovery that the strength, durability and water-tightness of concrete are dependent upon the proportion of water to cement it was customary to specify mixtures as one part cement to a certain number of parts of sand and pebbles. Modern practice is to state the amount of mixing water for each sack of cement, varying according to the class of work. For example, the recommended mixture for sidewalks and that class of work is 4¼ gallons of water per sack of cement, when sand and pebbles are in a moist condition. Moisture in the aggregates is free to act on the cement, so less water is added in this case than if these were absolutely dry. Had these been dry, the correct amount of water would be 5½ gallons for each one sack batch.

In a concrete mix, cement and water form a paste which, upon hardening, acts as a binder cementing the particles of sand and pebbles together into a permanent mass. The use of too much mixing water thins or dilutes the paste, weakening its cementing qualities. It is important that cement and water be used in proper proportions to get the best results.

The accompanying table gives recommended quantities of water for different classes of work and also suggests proportions of cement to sand and pebbles to use in trial batches. The trial batch for sidewalks is 1 part cement to 2 parts sand and 3 parts pebbles (1-2-3 mix). It may be necessary to change the amounts of sand and pebbles as will be described to obtain a smooth, plastic workable mix. Under

MIXTURES FOR SEVERAL CLASSES OF CONSTRUCTION

Intended primarily for use on small jobs

Kind of Work	Gallons of Water to Add to Each One Sack Batch			Trial Mixture For First Batch			Maximum Aggregate Size
	Dry Sand and Pebbles	Moist Sand and Pebbles	Wet Sand and Pebbles	Cement	Sand	Pebbles	
				Sacks	Cu. ft.	Cu. ft.	Ins.
Foundation walls which need not be watertight, mass concrete for footings, retaining walls, garden walls, etc.	7½	6	5	1	3	5	2
Watertight basement walls and pits, walls above grounds, dams, lawn rollers, hand tamper, shoe scrape, hot beds, cold frames, storage and cyclone cellar walls etc.	6½	5	4¼	1	2½	3½	1½
Waterstorage tanks, well curbs and platforms, cisterns, septic tanks, watertight floors, sidewalks, stepping stone and flagstone walks, driveways, porch floors, basement floors, garden and lawn pools, steps, corner posts, gate posts, piers, columns, chimney caps, concrete for tree surgery, etc.	5½	4¼	3¾	1	2	3	1
Fence posts, clothes line posts, grape arbor posts, mail box posts, etc., flower boxes and pots, benches, bird baths, sundials, pedestals and other garden furniture, work of very thin sections.	4½	3¾	3½	1	2	2	¾

no conditions vary the amount of water from the quantity shown.

The trial proportion (1-2-3) suggested for sidewalks may result in a mixture that is too stiff, too wet or which lacks smoothness and workability. This is remedied by changing slightly the proportions of sand and pebbles, not the water. If the mix is too wet, add sand and pebbles slowly until the right degree of wetness is obtained. If the mix is too stiff cut down the amounts of sand and pebbles in the next batch. In this way the best proportions for any job may be determined.

A workable mixture is one of such wetness and plasticity that it can be placed in the forms readily, and that with spading and tamping will result in a dense concrete. There should be enough cement-sand mortar to give good smooth surfaces free from rough spots, and to bind pieces of coarse aggregate into the mass so they will not separate out in handling. In other words the cement-sand mortar should completely fill the spaces between the pebbles and insure a smooth plastic mix. Mixtures lacking sufficient mortar will be hard to work and difficult to finish. Too much sand increases porosity and cuts down the amount of concrete obtainable from a sack of cement.

A workable mix for one type of work may be too stiff for another. Concrete that is to be deposited in thin sections like fence posts must be more plastic than for more massive construction such as walls. A good rule to follow is to proportion the sand and pebbles to obtain the greatest volume of concrete of correct plasticity for the work to be done.

Sand and pebbles or crushed rock are usually spoken of as "aggregate." Sand is called "fine aggregate" and pebbles or crushed stone "coarse aggregate." Fine aggregate such as rock screenings includes all particles from very fine (exclusive of dust) up to those which will pass through a screen having meshes ¼ in. square. Coarse aggregate includes all pebbles or broken stone ranging from ¼ in. up to 1½ or 2 in. In thin walls of slabs the largest pieces of aggregate should never exceed ⅛ the thickness of the thinnest section. Maximum sizes of aggregate for different classes of work are shown in the table.

Sand should be clean and hard, free from fine dust, loam and clay and vegetable matter. These foreign materials prevent bond between the cement and sand thereby reducing the strength of the concrete. Concrete made with dirty sand hardens very slowly and often will not harden sufficiently to be used for its intended purpose.

Sand should be well graded, the particles should be not all fine nor all coarse, but should vary in size from fine up to that which will just pass through a ¼-in. mesh screen. If the sand is well graded the finer particles help to fill the spaces between the larger ones.

Bank-run gravel is the natural mixture of sand and pebbles taken from a gravel bank. In this material fine and coarse aggregates are seldom present in proper proportions, usually containing too much sand. Money can be saved by screening out the sand and recombining in proper proportions according to the class of work.

Water used in mixing concrete should be clean, free from oil, alkali, and acid. In general water that is fit to drink is good for concrete.

All materials including water should be accurately measured. A pail marked on the inside at different heights to indicate quarts and gallons will be found handy for measuring water. A pail may also be used for measuring cement, sand and pebbles. In mixing one-sack batches it is not necessary to measure cement as one sack holds exactly one cubic foot. Sand and pebbles are then most conveniently measured in bottomless boxes made to hold one cubic foot, two cubic feet, or other volumes desired.

Although machine mixing is preferred, first-class concrete can be mixed by hand. Whichever way is used, mixing should continue until every pebble is completely coated with a thoroughly mixed mortar of cement and sand.

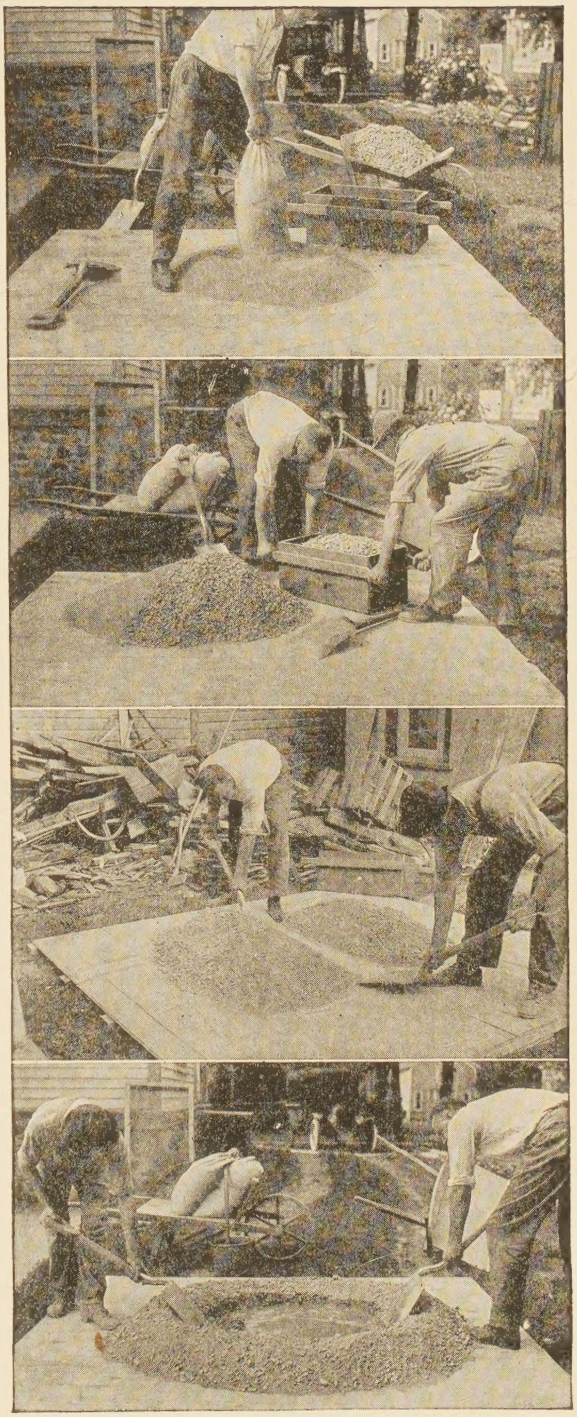
If a tight floor is not available for mixing concrete a watertight mixing platform should be made. It should be large enough for two men using shovels to work upon at one time. Seven feet wide and 12 feet long is a good size. This platform is preferably made of matched lumber so that the joints will be tight. Strips are nailed along three sides to prevent materials from being pushed off in mixing.

The measured quantity of sand is spread out evenly on the platform and on this the required amount of cement is evenly distributed. The cement and sand are turned with square pointed shovels to produce a mass of uniform color, free from streaks of brown and gray. Such streaks indicate that cement and sand are not thoroughly mixed. The required amount of coarse aggregate is then measured and spread in a layer on top of the cement-sand mixture. Mixing is continued until the pebbles have been uniformly distributed throughout the mass. A depression or hollow is then formed in the middle of the pile and the correct amount of water added while the materials are turned. This mixing is continued until the cement, sand and pebbles have been thoroughly and uniformly combined.

The concrete should be placed in the forms within 30 minutes after mixing. It should be well tamped or spaded as it goes into the forms. This operation forces the coarse concrete back from the face, making a dense concrete with smooth surfaces.

Do not permit the newly placed concrete to dry out. Protect it from the sun or drying winds for a week or ten days, otherwise the water necessary for proper hardening will evaporate, resulting in loss of strength. Floors, walks and similar surfaces can be protected by covering with earth or straw kept moist by occasional sprinkling as soon as the concrete has hardened sufficiently so that it will not be injured.

Walls and other sections which cannot be conveniently covered by this method can be protected by hanging moist canvas or burlap over them and wetting down the work frequently for ten days or so after placing. In cold weather work should be protected but need not be kept moist.



Steps in the Work of Mixing Concrete by Hand; Thorough Mixing and Accurate Control of Water Are Essential for Satisfactory Results

A CHEAP CONCRETE MIXER

By W. S. BETTS

THE farmer would use much more concrete construction than he does, were it not for the difficulty of mixing any large quantity by hand. A very satisfactory mixer, which should not cost more than $15, may be made by following these plans; it will mix about two wheelbarrow loads at a batch.

The mixer proper is a lime-sulphur barrel, tar barrel, or any other heavy-stave barrel with one good head, that is, a head that is perfectly flat and is firmly attached to the barrel. This barrel rotates around its long axis in a frame that is arranged to tilt within another frame, thus dumping the batch.

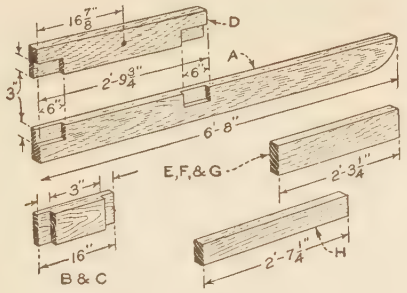
The gears, sprockets and chain, shafts, bearings, etc., can be salvaged from a garage junk pile, or purchased from one of the junkmen who make a specialty of wrecking cars. There should be no difficulty in finding the materials, as they are all common automobile parts.

Obtain a bevel gear, about 12 in. in diameter, and its pinion; the pair should have a ratio of about 4 or 5 to 1. This gear will be in the form of a ring bolted to a flange. Remove the flange, and bolt the ring gear to the best head of the barrel, first knocking out the other head. Be very careful to center this gear exactly on the barrel head. From the plumber, get a 3-in. boiler flange union, a 3 to 1-in. bushing to fit the union, and a 1-in. long nipple. The flange union is in two identical members, fastened together by bolts. One member should be centered on the head of the barrel and bolted to the other member on the inside of the head, sandwiching the head between the two members, as in Fig. 4. The bushing and nipple may now be screwed in. It is well to smooth the surface of the nipple with a file, or to skim it in a lathe, if one is available, as it is to turn in a bearing.

Three 14-ft. and one 10-ft. 2 by 6-in. timbers will suffice for the entire frame. It is better to get these dressed on all four sides. The dimensions of the main-frame pieces are shown in Fig. 1, and the manner of framing in Fig. 2. The half-lap joints should be carefully cut, and the inside of each joint should be painted before bolting together. The crosspieces E, F, and G, may be fastened by means of heavy lag screws if desired, although the method shown is the better. It will be necessary to strengthen the frame in front by two angle irons, shown in Fig. 2. The inside frame, which tilts within the main frame, is shown in Fig. 3. This is pivoted in the main frame, on the right side, by means of a heavy bolt turning in a piece of pipe, as shown in Fig. 7, but the left side is somewhat different. The pivot shaft must extend beyond the main frame, and be held fast, so that the pulley, shown in Fig. 5, may turn upon it. This is best accomplished by means of a flange through which the shaft passes, and by which it is rigidly held, the flange being securely bolted to the outside of the main frame. The hub of a discarded automobile wheel will furnish the flange, and an automobile axle the 1¼-in. shaft. As the inside frame turns upon this shaft, it is well to use a piece of 1¼-in. pipe for a bearing. The inside frame may now be put in place, when it will be found that the projecting end of the board M, Fig. 3, will strike on the back left-hand corner of the outside frame. Cut this corner off so that the inside frame will be nicely seated.

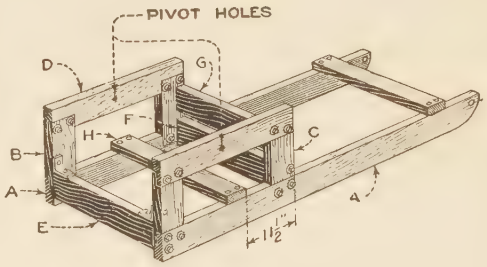
The pulley that takes the belt from the engine should be of such size that the mixer will rotate 40 or 50 times per minute. This is a simple calculation, as the gear ratio at the barrel head is known, and also the speed of the engine, and the size of its pulley. Simply multiply the speed of the engine by the size of the driving pulley, and by the number of teeth in the pinion. Divide this result by the product of the number of teeth in the bevel gear and the number of revolutions the barrel is to make.

For example, supposing that the engine makes 300 r.p.m., the engine pulley is 8 in. in diameter, the bevel gear has 40 teeth, and the pinion 10, and that the speed of the barrel is to be 40 r.p.m.: The speed of the engine, 300, is multiplied by the size of the pulley, 8, and by the number of teeth in the pinion, 10. The result is then divided by the product of the number of teeth in the bevel gear, 40, and the r.p.m. of the barrel, 40; the result is 15. This is



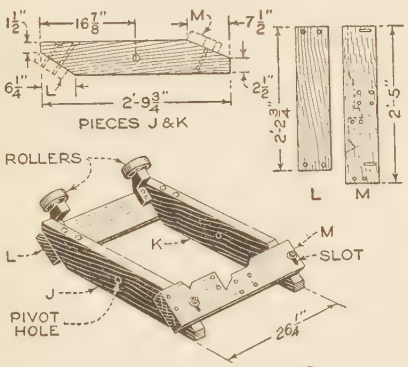
DETAIL OF MAIN-FRAME MATERIAL

Fig. 1



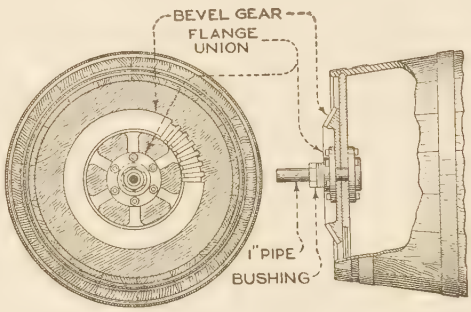
MAIN FRAME ASSEMBLED

Fig. 2



DETAIL OF INSIDE FRAME

Fig. 3



DETAIL SHOWING GEAR CONNECTIONS

Fig. 4

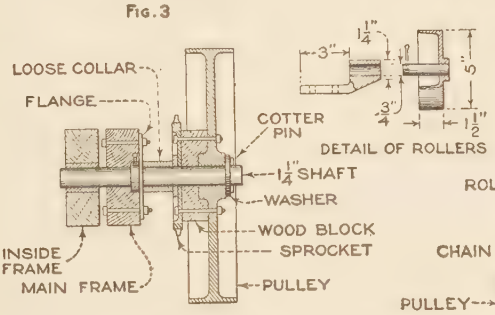


Fig. 5

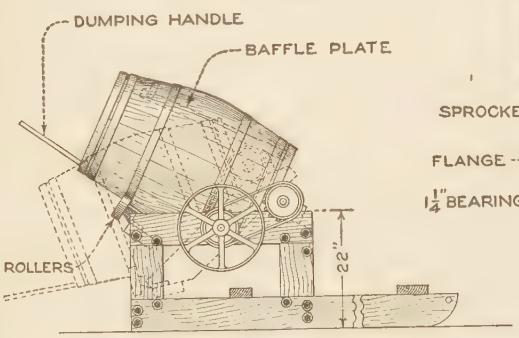


Fig. 6

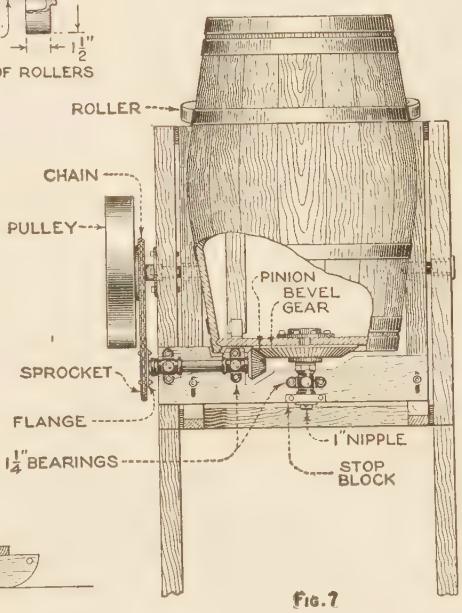


Fig. 7

Complete Details for the Building of a Cheap but Strong and Durable Concrete Mixer for the Farm: All the Mechanical Parts may be Obtained from the Automobile Junk Dealer, and the Necessary Lumber will Usually be Found around the Farm

the size of the necessary pulley, in inches. There is no reduction of motion in the sprockets, as they are of equal size. The pulley should be bored to take the 1¼-in. shaft.

From the junkman obtain two sprockets, such as are used for chain-drive trucks, and about 5 ft. of sprocket chain. These sprockets are in the form of rings bolted to flanges. Remove the flange and bolt the ring to the belt pulley, as in Fig. 5. It will be necessary to block the sprocket out from the pulley, so that the chain may clear, and this is best done with a wood block. Bolt the sprocket through the wood to the spokes of the pulley. The pulley and sprocket may now be slipped onto the shaft, where they should turn easily, first inserting a collar of 1¼-in. pipe and a washer for the pulley to bear against. Fig. 5 shows the complete details.

The builder is now ready to transfer the motion from the pulley and sprocket to the barrel. The motion is received from the pulley by the second sprocket, which is fastened to a 1¼-in. shaft, at the other end of which is keyed the bevel pinion. This pinion engages the bevel gear on the head of the barrel. The details are given in Fig. 7. The shaft turns in two 1¼-in. bearings, such as are used for automobiles. It will be seen that the board M, Fig. 7, is cut away to clear the barrel chine, gears, etc. No dimensions can be given for this, as the amount cut will probably differ in every case. The best way to do this is to put the barrel in place with the nipple resting on board M. Block up the front of the barrel 2½ in. from the board L, Fig. 3. Line the shafts up carefully, and cut away board M, so that the bevel gear may engage with its pinion. Bolt the shaft bearings into place, also that bearing for the nipple. A hardwood stop block, bored to accommodate the nipple, should now be bolted to board M, and a washer and pin inserted. This is to prevent the barrel from sliding forward when tipped.

The front end of the barrel is supported and rotates on two rollers, or casters, shown in Fig. 6. If two heavy discarded ball bearings can be obtained with the other parts, they will make splendid rollers, if protected from the cement and dirt; it will probably be necessary, however, to have these rollers cast in the nearest foundry. The cost should not be over $3 each. The measurements are shown in Fig. 5. These rollers should be bolted to board L, so that the barrel will rotate between them, and so that they will keep the nipple at the head of the barrel central in its bearing.

A dumping handle bolted to the inside frame, and a baffle plate fitted inside the barrel, as indicated in Fig. 6, complete the machine. The baffle insures thorough and complete mixing of the concrete, and is essential for a good job. If the work has been carefully done, the machine should give as good service as commercial types costing five times as much.

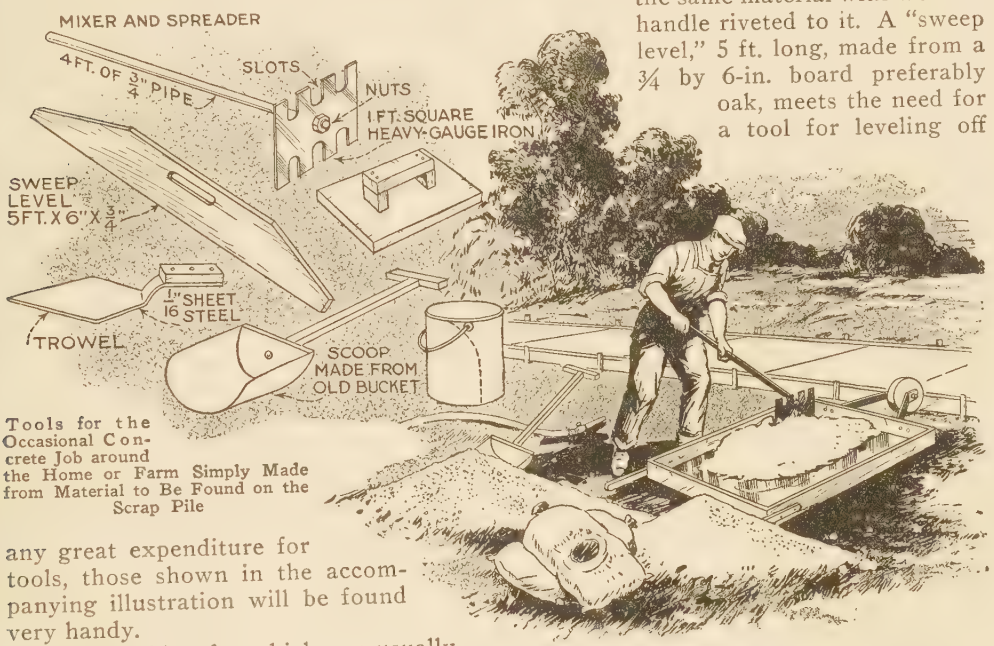
Cinders as Aggregate

Cinders are used to some extent as a substitute for crushed stone or gravel. They are lighter and more porous than stone and less strong, but where lightness is more important than strength or where a poor conductor of heat or sound is required, they may be used. Successive floors of tall buildings are often laid with cinder concrete. Roofs are also constructed with it. Cinder concrete may be cut more easily than concrete made of stone; nails may be driven into it. The cinders used for concrete work should not contain much, if any, fine ashes. Wood ashes should not be used at all. The cinders from power plants are better than ashes from household furnaces because the intense heat of the former fuses most of the ash into hard material, leaving little or no fine matter. Where the cinders have been drenched with water as soon as drawn from the furnace, they are still better, for the reason that the fine material is washed out. Cinders are easily crushed, and it is better practice not to ram concrete in which they are used, because the breaking up of the aggregate means increasing the surface to be covered by the cement. Both slag and cinders absorb more water than pebbles or crushed stone, and therefore require more wetting. As cinders have been subjected to intense heat, the material is good from a fireproof point of view.

Homemade Tools for Small Concrete Jobs

By G A. LUERS

WHERE there are only occasional calls for a small concrete job, and the amount of work does not seem to justify any great expenditure for tools, those shown in the accompanying illustration will be found very handy.



Tools for the Occasional Concrete Job around the Home or Farm Simply Made from Material to Be Found on the Scrap Pile

The first thing for which one usually has to hunt is a mixing board. It will be found to save time in the end to make a board, as shown in the drawing, and keep it for future jobs. This consists of a shallow box, about 4 ft. square, fitted with a small roller or wheel and two handles, like a wheelbarrow, to facilitate moving the board about, and to aid in carrying the other tools and materials to the job. A mixer or hoe, of heavy sheet iron or steel and provided with a handle made from ¾-in. pipe, will be found a very useful tool, as is also the trowel of the same material with wooden handle riveted to it. A "sweep level," 5 ft. long, made from a ¾ by 6-in. board preferably oak, meets the need for a tool for leveling off the tops of concrete walks, or for otherwise drawing concrete rapidly to an even surface. A wooden float, about 12 by 14-in., will work up a wet top surface on the concrete, and may also be used as a mortar board for small jobs. The scoop measure is made from an old bucket, in the manner shown in the illustration. The size of this being immaterial, it may be chosen to suit individual taste.

Maintenance of Concrete Silos

In the spring it is time to think of your silo, which, possibly, is in need of repairs. Silage juices, if not cleaned off cement walls, will continue their destructive action on the cement. Small pinholes enlarge rapidly during the hot summer days and in a short time the walls begin to crack and the silo will leak. To clean cement walls, use large-size wire brushes and hot water. It is advisable to dissolve about 1 lb. of coarse salt to each pail of water, which should be very hot. This application will kill the destructive germs of the silage juices. After drying, it is a good idea to cement-wash the walls as smooth as possible.

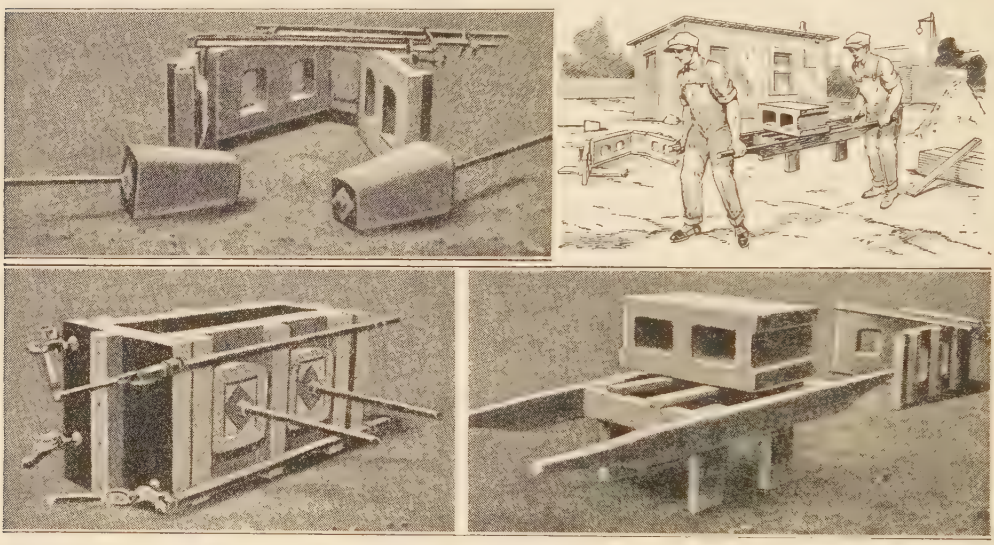
Cement in Whitewash Prevents Flaking

Ordinary whitewash that we used in the interior of a poultry house, flaked off soon after its application. To overcome this a half pint of cement was stirred into two gallons of whitewash. It is necessary to keep the whitewash well agitated to prevent the cement from settling on the bottom of the container.

Mold for Making Concrete Blocks

By A. J. R. CURTIS

THE mold illustrated can be made from wood by any mechanic, and used to produce concrete building blocks for quite a good-sized building. The bottom, ends and sidepieces are made from thoroughly kiln-dried white pine, 2 in. thick, strengthened with 2-in. square cleats. The cores are merely tapered sections of 6 or 8-in. square posts. The wearing edges of the sides and ends are protected with strap iron, screws being used to attach both the cleats and strap-iron reinforcing. Handles of ½-in. rod or pipe through the cores are provided, so that they can be removed from the mold after the block has been cast. Carpenters' or cabinetmakers' quick-acting clamps provide the best means for holding the parts together rigidly, although simple strap-iron hooks and wooden wedges can be used if clamps are not available.



The Upper Photograph Shows the Concrete-Block Mold Opened, with Its Cores and Clamps; Below, Left, the Clamps Applied and the Cores in Position to Cast a Concrete Block. The Face of the Block can Be at Either the Top or Bottom of the Mold. Right, One of the Blocks Cast in the Homemade Mold, Showing the Hollows at the Center. These Openings Make the Block Lighter and Improve Its Insulating Qualities

Before using the mold, it should be painted inside and out with any kind of light oil that will fill up the pores of the wood and keep out water. If the inside faces have been properly planed and sanded, the oil surfaces will produce correspondingly smooth surfaces on the blocks. Only enough free oil should be left on the forms to prevent the concrete from sticking, the surplus being removed with a piece of waste.

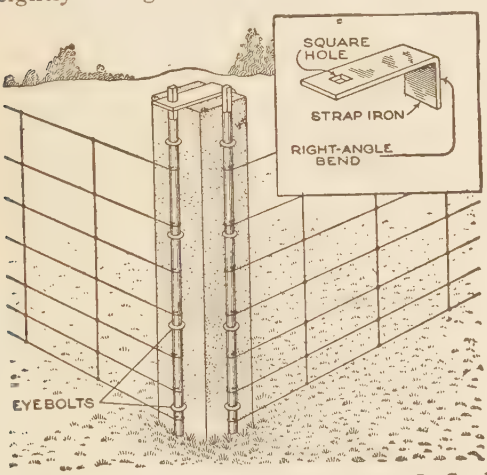
The blocks may be cast either face down or face up, as preferred, and it is recommended that only plain-face blocks be made, as they are simpler and better-looking than the rock-face block. If the face of the block is to be down, a facing mixture is first placed in the mold to a depth of ¾ in., and the remaining space in the mold box is filled with ordinary concrete, mixed as wet as possible, yet so that it will stand up without sagging when the mold is removed. If the facing is to be placed on the upper side, the mold is filled to within ¾ in. of the top, and struck off with a template, after which the facing mixture is placed. Of course, all the concrete must be tamped thoroughly, and this is best done with a small foundry rammer, or one so constructed that the mixture is thoroughly compacted around the cores and in the corners.

The plain-concrete backing may be made of a mixture of 1 part cement to 3 or 4 parts of clean gravel, varying in size from minute particles to ¾-in. pieces. The facing should consist of a mixture of 1 part cement to 2 or 3 parts of white sand, marble dust, or granite, the proportion and color of the ingredients determining the color and texture of the finished article. Cement-stucco mixtures, in a variety of colors and textures, may be obtained from building-material dealers. After the block has been thoroughly

compacted in the mold and the top struck or floated off, a straight, true pallet, made from 2-in. plank and cleated on the back, is clamped to the top of the mold, which is then turned over until the block rests on the pallet. The cores are then withdrawn, the mold carefully removed, and the block set away in a warm, moist place to season. The blocks should be carefully protected against sun, draft, and frost, preferably being stored where the temperature can be kept as high as possible and where the blocks can be sprinkled frequently, commencing as soon as this can be done without injury to the block. It is almost fatal to let blocks become dry during the first two weeks.

Fence Tightener on Concrete Corner Posts

A woven-wire fence is seldom stretched tightly enough to remain taut, and if it



A Neat Wire Fence Next to the Highway Is Good Advertising. This Tightener on the Corner Posts Keeps the Fence Taut and Neat-Appearing

becomes slack, it is not only something of a reproach to the owner, but rather difficult to stretch again. An easily made tightener, attached to the corner posts, makes it possible to tighten the fence at any time.

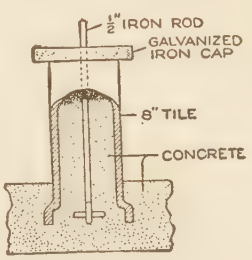
The post forms are set up on the spot, and four eyebolts are inserted in each of the outer sides, before the concrete is placed. After the concrete has set, the forms are removed, leaving the eyes protruding about 1 in. Two pieces of iron rod or pipe, of the proper length, are obtained and the upper ends squared off as shown. If pipe is used, the upper end should be plugged with a piece of iron rod held in place by a rivet or pin. Holes are drilled in each piece to correspond with the fence wires. The rods, or pipes, are inserted into the eyebolts and the fence wires put through the holes and bent over. A wrench is applied to the squared end of the pipe, and the fence is drawn up as tightly as desired; one of the right-angle wrenches, or holders, shown in the insert, is then applied to prevent the wire from unwrapping. These right-angle wrenches are made of heavy strap iron, long enough to fit over the post, as shown, and with a square hole at one end to fit over the rod. The square hole is made by heating the iron, and cutting the hole with a chisel, or a square punch. A separate wrench, or holder, is required for each tightener.—Dale R. Van Horn, Lincoln, Nebraska.

Permanent Marks on Concrete Floors

The aisles of a manufacturing plant must be kept open for the trucks, and a white line is usually marked on the floor, beyond which nothing is placed. These lines will require renewing often, as they wear away quickly. The owners of one factory overcame this difficulty and made a line that could not be worn away in the following manner: Two iron straightedges were placed on the floor, about ½ in. apart, and held down with weights while a compressed-air chisel was used to cut a slit in the cement, ¼ in. deep. The paint was then placed in this groove. The depression prevents any wear on the paint and a permanent line is the result.—J. C. Moore, Wilkinsburg, Pennsylvania.

Rodent-Proof Support for Corncrib

To prevent the inroads of rats and mice, and, at the same time provide a substantial support, a foundation for a corncrib was made of 8-in. tile set in concrete, as shown in the sketch. The tile was placed with the flange down, and a ½-in. iron rod was imbedded in the concrete with which it was filled. A galvanized-iron cap was fitted over the top and the iron rod passed through it to form a substantial fastening for the sills of the crib.



How To Make Concrete Tile

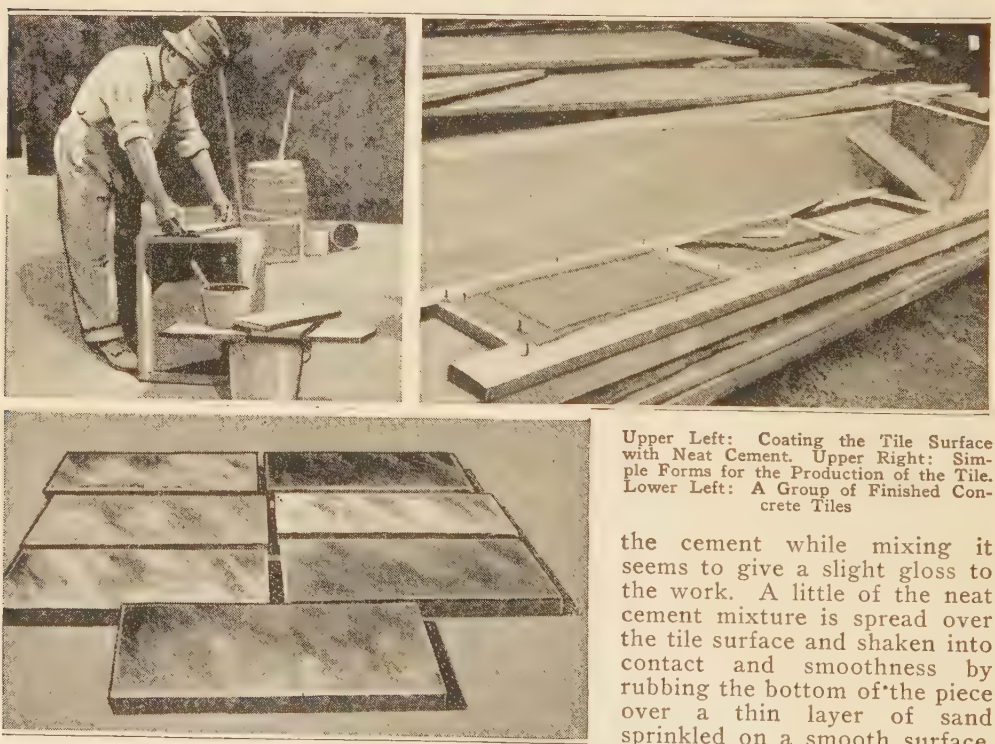
By HJALMER LINDQUIST

FLOORING, wall facing, garden walks, etc., are some of the common constructions in which concrete tiles are used. These tiles are not at all difficult to make, and the results of their use are well worth the time expended.

When only a few tiles are wanted, the forms can be made from two pieces of board, tacked flat to a wide plank, with other pieces tacked between them at right angles, to divide the individual tiles. The nails with which the boards are fastened are only partly driven in, so that they can be easily pulled when the tiles have set. These forms should be squared, and the lumber from which they are made should have straight smooth edges. If a considerable number of tiles are to be made, it will, of course, pay to have good forms ready beforehand so that the work can be done quickly, rather than make up rough forms as the work proceeds.

The forms are filled with a wet concrete mixture of 3 parts sand and 1 part cement. Some kind of reinforcing wire should be placed in the center of each tile to strengthen it; a coarse wire mesh will serve the purpose. The form is half-filled with concrete, the reinforcing put in, and the rest of the cement applied until the mold is filled. A little care will be required to get the corners of the work square and sharp; all corners should be well tamped with a short wire. The concrete is "struck" off flush with the top of the forms by drawing a straightedge over them. The top surface of the tile is left rough. Cleaning the top edge of the form, next to the tile, with the point of a trowel, will help give the tiles a better appearance when they are dry.

When finished, the tiles should be allowed to dry, before they are taken from the forms, preferably in the shade, as rapid setting is not advisable. They should then be soaked in water for about two days to harden them. After being removed from the water, they are allowed to dry overnight, and the top surfaces are coated with a neat cement, which is a mixture of cement and water, a little thicker than cream. Whipping



Upper Left: Coating the Tile Surface with Neat Cement. Upper Right: Simple Forms for the Production of the Tile. Lower Left: A Group of Finished Concrete Tiles

the cement while mixing it seems to give a slight gloss to the work. A little of the neat cement mixture is spread over the tile surface and shaken into contact and smoothness by rubbing the bottom of the piece over a thin layer of sand sprinkled on a smooth surface. When the top coating has set for a day, the tiles should be placed in water for a day or two, then allowed to dry for a day. The coloring can then be commenced.

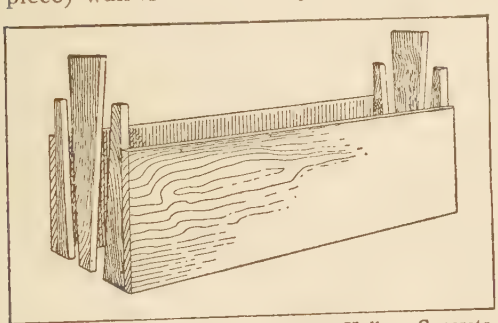
Coloring of the tiles is effected by inexpensive chemical solutions. A satu-

rated solution of copper sulphate, or bluestone, gives a bluish-green color, while a solution made from sulphate of iron or copperas produces a rust-red. By using a solution of either of these salts as a mordant, any of the dry cement colors can be used. The dry cement color is mixed with water to the desired shade, and then about 1/25 part, liquid measure, of either copperas or bluestone solution is stirred in. A syringe should be used in applying the colors; with this the colors can easily be varied and blended together on the surface of the work.

The tiles should be set in soft mortar, on a solid base, and the appearance of the work is often improved by spacing the tiles about ½ in. apart and filling this space with colored mortar. To color the mortar, the dry colors can be mixed with it directly. The tiles shown in the illustration are about 7 by 14 in. and ¾ in. thick. Other sizes, of course, can be made in the same manner.

Forms for Making Hollow Concrete Walls

A wall made from hollow concrete blocks can have a dead air space without any trouble, but the monolithic (one-piece) wall is not so easily constructed to

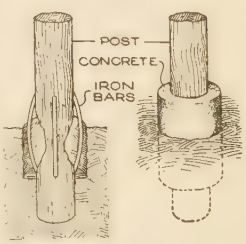


Collapsible Forms Used for Making Hollow Concrete Walls. The Forms are Raised as the Wall is Built

have an opening between two solid walls which are joined together at intervals. Such a wall can be constructed, but it is necessary to put in layers or sections of concrete using forms to make the open space, these forms being raised for each succeeding layer. The accompanying sketch shows a form for making the hollow space between two solid walls. The height of the form should be greater than the depth of each section to be laid, and 20 to 30 in. long. The cleats on the ends of the boards are made tapering toward the top with a wedge-shaped piece having the same slope on each edge for separating and keeping the sides parallel. After the concrete for the first layer is put in and set, the forms can be raised so a part of the bottom will remain in the set concrete and the wedges placed so the next layer can be tamped in. A sufficient number of forms should be provided to extend the length of the wall being made. When starting the wall, the forms are set 5 in. apart and these spaces should have twisted wires well imbedded in the concrete as it is being tamped in to tie the two sections of the wall together.—Newton Bawn, Eagle Grove, Iowa.

Renewing Wooden Posts with Concrete

Wooden posts, supporting fences, signs, or buildings generally, decay at the ground line. It is not always possible to renew them without disturbing the structure they support, and besides, if the timber is sound except at the one point, there is a needless waste of lumber if they are discarded. To renew the life of such a post it is only necessary to remove the dirt for 6 in. around the post. Next a wooden or sheet-metal form is made, and concrete poured in the form around the post, reinforced with iron bars, to a level with the top of the form. After the concrete has set, the post is stronger and less likely to decay further than before the treatment.—K. M. Coggeshall, Webster Groves, Mo.



Cement Brick

Because of the many improvements that have been made in the manufacture of cement brick within the past three or four years, this cement product is rapidly winning increased favor. The essentials of manufacture are like those for cement block. The common mixture used is 1:3 in which the aggregate is clean, coarse sand. Where it is desirable to face the brick with a richer material or a selected aggregate surface, such facing mixtures should be in the proportions 1:2, the aggregate being then selected colored sand, granite screens, marble chips or a combination of several selected aggregates to secure the desired texture and color of surface.

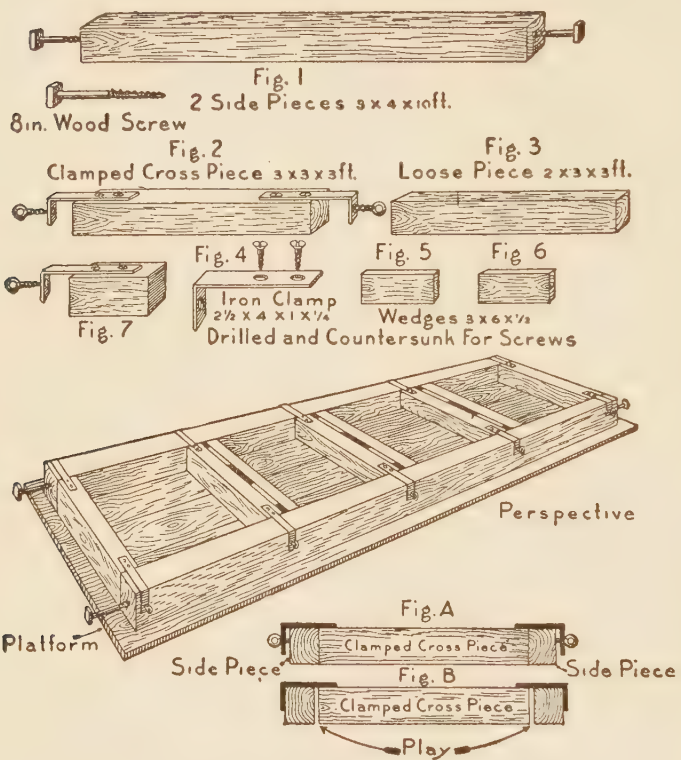
Spading Concrete

To obtain the maximum density, and a good surface, on concrete work, the wet mixture should be spaded into place rather than tamped. A convenient tool for spading can be made by straightening out an ordinary hoe, so that the blade is in line with the handle. Special spading tools are also made with perforations in the blades, to assist in bringing the sand-cement mortar against the faces of forms, while holding back the coarser particles in the concrete. Concrete that has been spaded is less likely to be leaky, and a better appearance is obtained when the forms are removed.

¶The surface of cement floors may be cleaned of oil for making repairs by a few applications of muriatic acid. In using the acid, great care should be taken that all traces of the acid are immediately removed by drenching the surface with water, as the acid will attack the concrete if not washed away. The proper solution to use for this purpose is about 1 part of ordinary strength muriatic acid to 3 parts of water.

Making Concrete Sidewalk Flagging

The ease with which concrete lends itself to almost every form of construction, enables even the most inexperienced to produce with it articles of practical worth and utility; one of the most useful and easily constructed articles being concrete sidewalk flags or slabs, which can be made by any handyman.



Simple Homemade Forms for Making Concrete Sidewalk Flags or Slabs. The Form may be Moved Almost as Soon as the Concrete Sets

Various forms of homemade molds are used, their construction depending entirely upon the ingenuity of the block maker. The writer has met with good success in using the adjustable frame described herewith, its construction permitting the frame to be moved almost as soon as the cement sets. This allows more rapidity in the manufacture — most men like to keep on with the work when once they have acquired the swing.

The frame consists of two sidepieces 3 in. thick, 4 in. wide, and 10 ft. long, fitted at each end with 8-in. wood screws to serve as handles. Fig. 1, three loose pieces; Fig. 3, 2 in. thick, 3 in. wide and 3 ft. long, five dividing or crosspieces; Fig. 2, 3 by 3 in. and 3 ft. long, fitted at each end with L-shaped iron clamps; Fig. 4, these clamps should be ¼-in. wrought iron, 1 in. wide, 4 in. long on top, with a right-angled bend, 2½ in. long, at one end and drilled with two countersunk holes on top and one hole for a screw-eye in the angle end. Screw the clamps on the ends of the crosspieces so as to allow some play between the inner faces of the clamps and the outer edges of the sidepieces. The purpose of this is to permit the sidepieces being moved a trifle away from two sides of the completed blocks. This is shown in Figs. A and B. Two or more wedges, Figs. 5 and 6, ½ by 3 by 6 in., are placed between the loose crosspieces and dividing pieces to accomplish the same purpose for the other two sides of the completed blocks.

The proportions of this frame will give four blocks 3 in. thick, 2 ft. wide, and 3 ft. long. It can be adjusted to make a longer or smaller number of blocks by dispensing with or adding more dividing and loose pieces. Yellow pine was used for the side and dividing pieces and hemlock for the loose pieces. For strict accuracy, the frame would have to be 9 ft. 10½ in. to mold four blocks in proportions given, but this discrepancy is easily overcome by setting the end crosspieces ¾ in. in from each end.

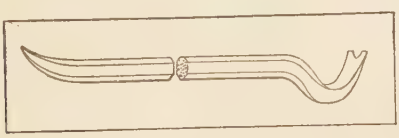
In operation the endpieces are placed in position, screweyes screwed through the holes in the clamps and into the sidepieces, crosspieces inserted and clamped, the loose pieces placed against them and wedges inserted between. The lining of newspapers is now placed on the bottom and against the four sides of each block space, concrete is poured in, rammed, and the top coating poured on and planed off with a straightedge when sufficiently set.

The frame is removed by unscrewing and withdrawing the endpieces; unscrew the crosspieces and pull the sidepieces outward as shown in A and B. Withdraw the wedges, draw away and remove the loose pieces, do likewise with the clamped crosspieces and finally take away the sidepieces.

With a number of platforms, a surprisingly large number of blocks can be turned out in a short time, and the work can be kept going continuously with the one frame.—James M. Kane, Doylestown, Pa.

Claw Bar for Removing Concrete Forms

Among the small tools required for carrying on reinforced-concrete work none comes in more useful for a variety of purposes than a supply of crowbars,

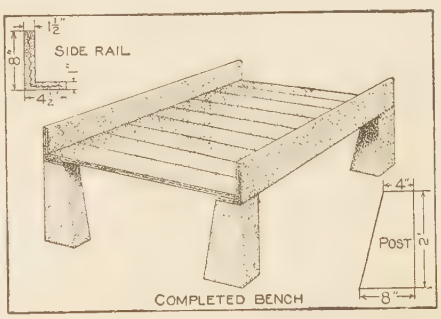


Claw Bar, Made of Steel, That will be Found Very Useful for Removing Concrete Forms

claw bars, and chisel bars. As a rule such bars can be worked up on the job or by a local blacksmith from reinforcing material and need not be purchased at all. For chisel bars the steel need only be cut to length and sharpened to a chisel edge at one end, says Engineering-Contracting. Bars so made can be used in an emergency for crowbars, and they have numerous uses such as chipping concrete, prying reinforcement into position, knocking out keys and spacers. Claw bars for removing forms and drawing nails can be made in the same manner. A good shape of claw bar for removing forms is shown by the accompanying sketch. This bar can be made of round or square iron as well as of the section sketched, and any ordinary blacksmith can do the work. Being made of reinforcing steel these various bars, if it is not desired to keep them, can, toward the end of the work, be used as reinforcement.

Concrete Benches for Greenhouses

The accompanying sketch shows the construction of parts to build a concrete bench for the greenhouse. The parts can be made in a metal or wooden mold and reinforced with expanded metal. The side rails are made in an angle as shown and are about 6 ft. in length. The bottom



A Concrete Bench for the Greenhouse Made Entirely of Concrete

pieces are 1 in. thick, 8 in. wide and in any length to suit the space. The posts are 2 ft. high and have one side perpendicular, and the other three sides inclined to make the top 4 in. square and the bottom 8 in. The straight side is placed toward the walk or wall, whichever it may be. A correspondent of Florists' Review says that the weight of the soil and plants holds the side rails so firmly that an ordinary man has not strength enough to pull one of the pieces out.

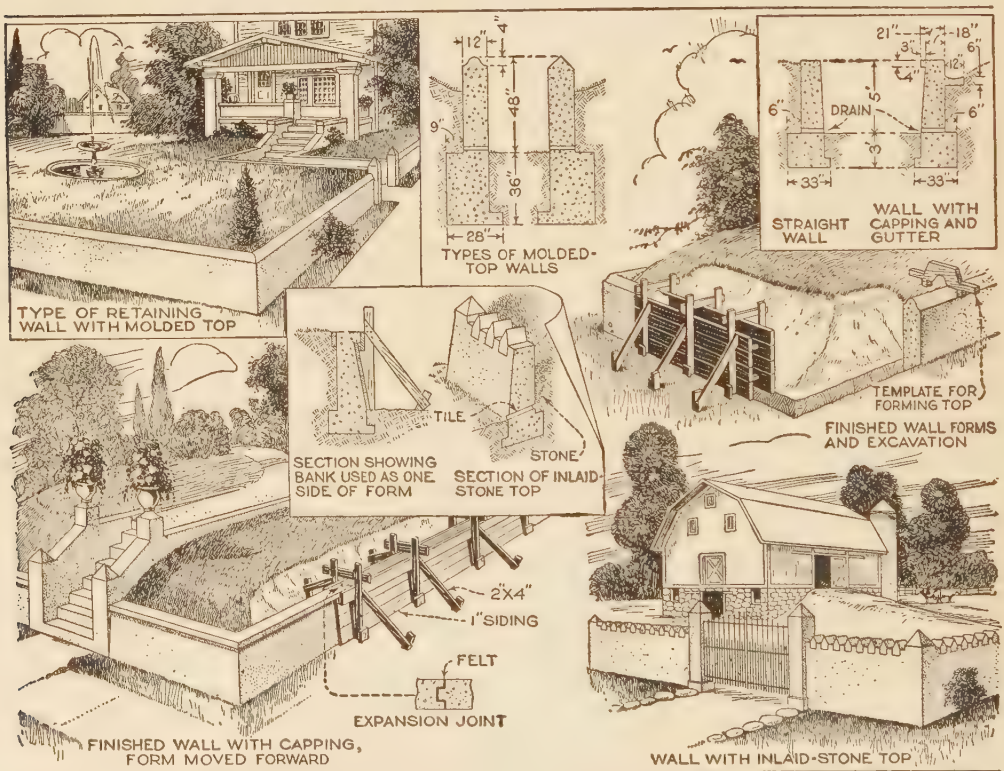
¶Sand and cement should never be mixed long before the pebbles and water are added to complete the mixture, because all sand contains sufficient moisture to start a setting of the cement which would rob the concrete of some strength.

Building Concrete Retaining Walls

By A. C. COLE

THERE is nothing at all difficult about the building of retaining walls in concrete, the cost of the work is low, and the finished wall adds greatly to the appearance of the inclosed grounds.

The excavation for the wall footings must be carried below the frost line, and, where the earth is firm enough, the bank itself may be used as one side of the form, undercuts being made in the bank to form the projecting lower portions of the footings. Where the earth is not self-supporting, it is, of course, necessary to cut away the bank so that forms can be used on both sides and the wide footings poured. This, however, is not a disadvantage, as it allows a layer of loose stones, gravel, or cinders to be laid along the back of the wall before filling back the earth, and this helps the drainage.



Various Forms of Easily Made Retaining Walls in Concrete: Details of Molded, Capped, and Inlaid-Stone Tops are Given in the Inserts

As may be noted in the drawings, the forms are very simple; 1-in. siding is used for the sides, with 2 by 3 or 2 by 4-in. uprights and braces. Enough uprights, braces, and struts must be used to prevent the forms from bulging, and

the walls held the proper distance apart by short pieces of the material used for the uprights. The walls are held by twisted-wire ties in the usual manner, and by cross braces at the top; the spacing pieces are moved upward as the concrete is placed.

As soon as the footings have been placed, and the forms erected, a number of concrete drain tiles are placed in the forms, as indicated in the sectional drawings, to carry off water, and the remainder of the concrete is then placed. The concrete used should be mixed in the proportion of 1 part cement, 2 parts sand, and 4 of clean, broken stone, and, when pouring the concrete, a flat, sharpened stick or a spade should be used to cut down between the form and the mixture, to work the stone back from the face of the wall, rendering the surface dense and smooth.

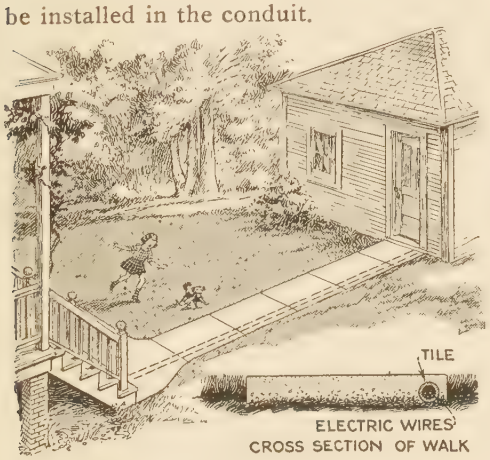
If the wall is at all long, the work should be done in 20-ft. sections, moving the forms along as soon as the concrete in one section has set, and expansion joints, of the type shown, filled with asphaltic felt, provided between sections.

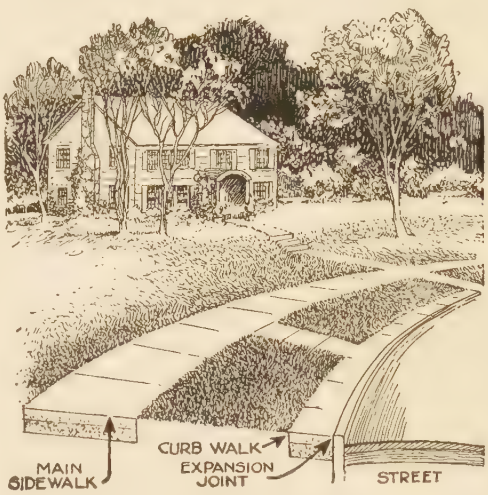
Various forms of coping are shown in the drawing. The molded top presents a very neat appearance, and is easily formed by means of a wooden template, drawn along the top of the wall while the concrete is still "green." With a little more trouble, a neat gutter may be formed on the back of the wall, the trough being shaped with a trowel. A particularly attractive top is formed by inlaying stone blocks, as shown in the lower-right-hand view, although this is rather more expensive.

The forms can be removed as soon as the concrete has set enough to sustain its own weight, and the surfaces may be finished by simply rubbing with a wooden float dipped in water and sand; in this way the form marks are rubbed off, and a smooth, permanent surface obtained.

Electric Conduit Imbedded in Concrete Walk to Garage

Electric wiring from the house to the garage can be run through conduit imbedded in the concrete walk when the latter is laid. This method eliminates overhead wires, which are more or less objectionable and may cause trouble. If no conduit is available, ordinary tile can be used, but in that case, flexible metal-covered conduit should be used instead of separate rubber-covered or weatherproof conductors. If desired, bell wires can also be installed in the conduit.

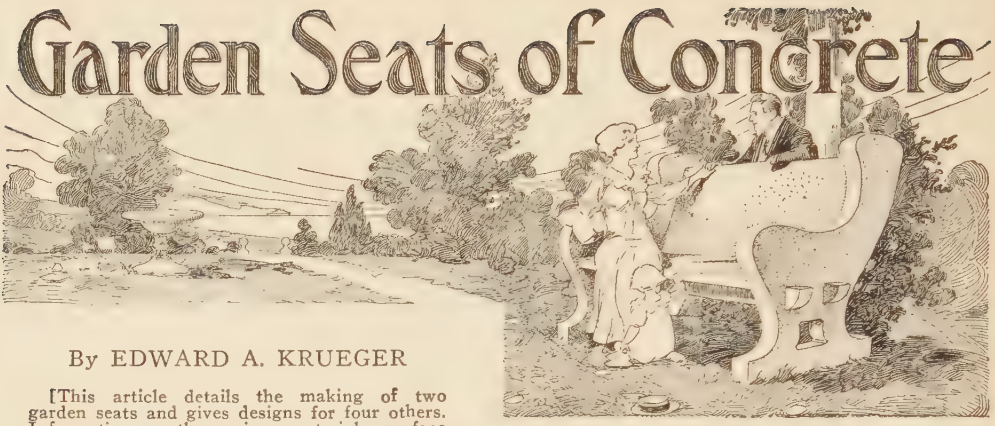




Narrow Curb Walks Protect Grass

The problem of keeping grass in parkways between curbs and sidewalks from being trampled down by pedestrian traffic can be solved by laying narrow concrete walks along the curbs. These walks are made about 2 ft. wide and 5 in. thick, and are separated from the curbs by bituminous expansion joints, as shown in the drawing. They are connected to the main sidewalk by crossings, about 50 ft. apart.

Garden Seats of Concrete



By EDWARD A. KRUEGER

[This article details the making of two garden seats and gives designs for four others. Information on the various materials, surface finishes, and the mixing of concrete is given in pamphlets furnished gratis by manufacturers of Portland cement.—Editor.]

THE making of cement products is especially practicable for the home worker in that the materials required are inexpensive and easily procured; with reasonable care, excellent results may be obtained, even by a novice. The permanence of concrete, properly mixed and placed, commends it as a constructive material for many objects of use and ornament exposed to the elements.

A garden seat like that shown in Fig. 1, without the paneling on the edges, involves first the making of a plain box form for the top slab. This may be used for the making of two or more supports by nailing partitions in the form, as shown in the sketch and detail drawing, Fig. 2. A smaller form is required for the foundations, which are cast in molds separated by partitions.

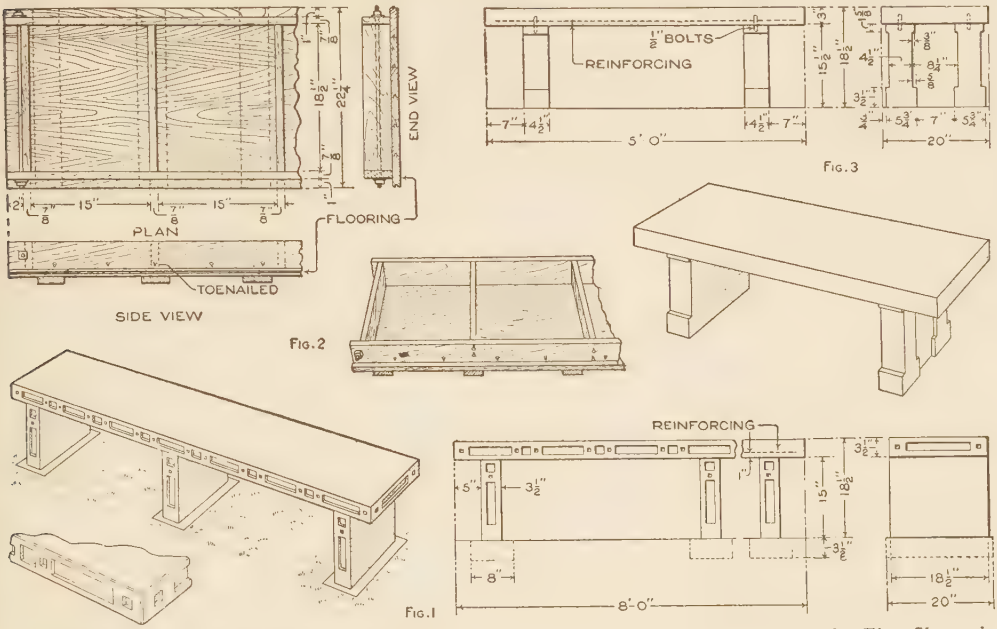
Make a rectangular form, having inside measurements of 18½ in. by 8 ft., and 3½ in. deep, for the top slab. Build up the platform for the form of ⅞-in. flooring, and smooth the top surface to give a good finish to the concrete. Cut the endpieces squarely, 18½ in. long, and fit them between the sidepieces. Screws, 12-penny common nails, or bolts, as shown in Fig. 2, may be used to hold the form together. Square the form, and nail strips across the upper edges to prevent the weight of the concrete from forcing out the sides. Toenail it in place on the platform, clean the interior, removing nails or other obstructions, and smooth off rough parts with sandpaper. Fill any irregularities in the inner surfaces of the form with plaster of Paris, and permit it to dry. Apply one or two coats of shellac to the inside of the form, to protect it from the moisture. When the shellac is thoroughly dried, apply a uniform coat of linseed oil to the mold and the form is ready for the concrete. If many slabs are to be made with a mold, soak the wood thoroughly in crude oil before making the form.

If the form for the supports is made from new stuff, the process of construction is similar to that described. Set the partitions squarely, 15 in. apart from face to face, nailing them as shown. If the form for the top slab is used for the supports, clean it, and apply fresh coats of shellac and oil for each successive use. The weight of the top slab is usually sufficient to hold it in place. If desired, bolts or iron pins may be cast into the upper edges of the supports and fitted into holes in the top slab, as shown dotted in Fig. 3.

The top slab is reinforced with heavy wire mesh, or with ¼-in. round iron rods. The latter extend lengthwise of the slab, set on 3-in. centers, and crosswise on 10-in. centers, their ends being 1½ in. from the adjacent edges of the slab. They should be wired together to form a mat, or wired to light wire mesh. The reinforcing is placed 1 in. from the lower side of the slab, as shown in the working drawings, Fig. 1. It is important, therefore, that the upper side of the slab be marked when the form is removed, as the reinforcing is less effective if the slab is inverted. If bolts are used in the supports, set wooden pegs of the proper size at corresponding points in the bottom of the mold.

Prepare the concrete mixture and pour the mold as follows: Mix thoroughly a batch of concrete just sufficient to fill the mold, using 1 part of Portland cement to 3 parts of coarse, clean sand, a 1:3 mixture. Fill the mold uniformly to a depth of 1 in. and set the reinforcing into place, as shown in Fig. 4. The concrete should be wet enough so that water will rise to the surface with slight tamping. Fill the mold, tamp the

concrete, especially around the edges, and jar it to force the mixture well into the mixture. The slab should be moistened two or three times a day while



Plain Slabs of Uniform Width, Paneled if Desired, are Used for the Seat Shown in Fig. 1. That Shown in Fig. 3 Involves the Use of Special Forms for the Shaping and Paneling of the Supports

the corners. Level the surface with a straightedge, and finish it carefully with a trowel. The edges may be rounded slightly with an edger, or struck off at a slight bevel, using the trowel. The supports are made similarly, but without reinforcing. The edges are left square.

Permit the filled mold to remain at least 48 hours, when the sides of the form

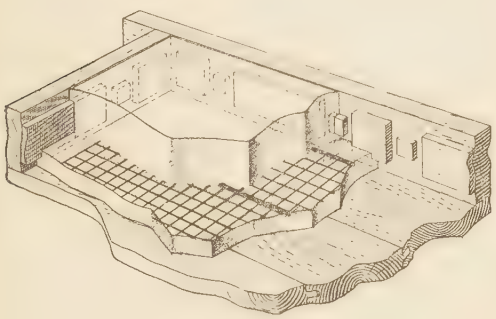


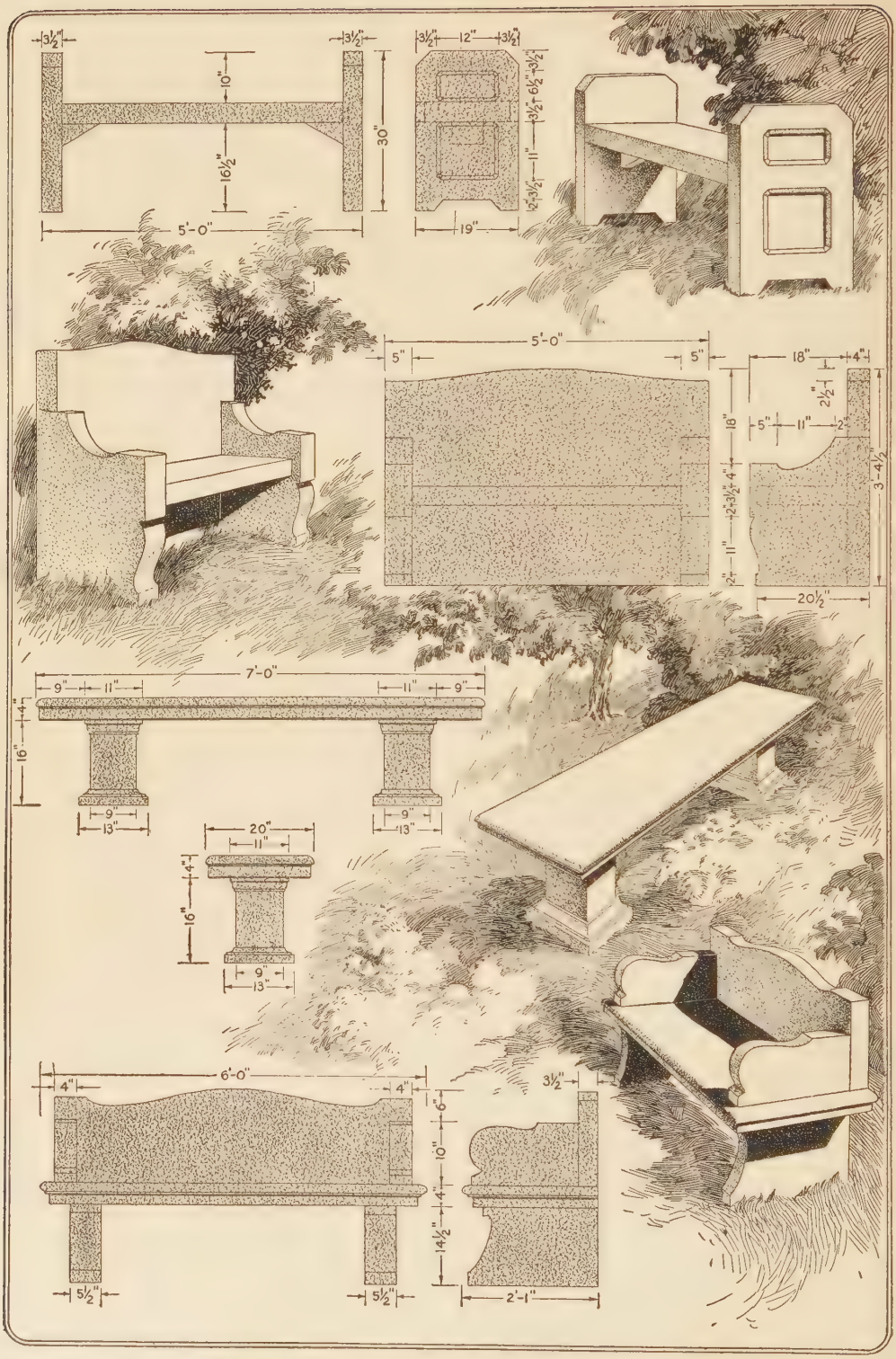
Fig. 4

The Method of Making the Edge Panels and of Reinforcing the Top Slab

may be removed. The slab must not be moved from the platform, on which it was cast, for at least a week. If the edges are chipped or corners broken away, patch them by moistening the broken parts and filling the irregularities with "curing," and should not be exposed to heat, to a drying wind, or to the sun. Set the foundations, leveling them with great care, and mount the supports on them, set in a course of cement mortar. Set the top slab into place, upon courses of cement mortar, if no bolts are used. The advantage of using bolts is that the seat may be taken down readily and moved to a new setting.

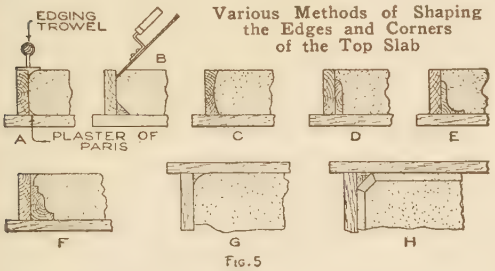
Possibilities for simple ornamental treatment of this garden seat and slight variation in the finishing of the corners and edges are shown in Figs. 5 and 6. Finishing of the edges of the top slab in curved, straight-line, and molded forms are shown in Fig. 5. The use of a plaster-of-Paris fillet in the lower corner of the mold, and the rounding of the upper edge with an edging tool, are shown at A. The beveling of the lower edge by means of a triangular wooden fillet and the striking off of the upper edge with a trowel are shown at B. Views of the filled mold from above, the corners shaped with fillets, are shown at G and H.

The paneling of the edges of the plain slabs, as shown in Fig. 1, relieves the severe outline and adds a touch of individuality. The panels are ⅜ in. in depth and are made by nailing blocks into



These Garden Seats and Benches of Simple, Dignified Design may be Made by One of Fair Mechanical Skill at Small Outlay. They Add to the Comfort and Beauty of the Home Grounds, and Are of Substantial Construction, to Withstand the Elements

the form, as shown in Fig. 4. Bevel their edges slightly to produce "draft" for the easy removal of the form, as indicated in the cross sections in Fig. 6. To insure that the concrete is cast around these



Various Methods of Shaping the Edges and Corners of the Top Slab

Fig. 5

blocks, press the mixture into the corners as the mold is filled. Several forms of panels are shown in Fig. 6, the edges of the slabs being shaped to harmonize with them.

New constructive elements are introduced in the forms for the garden seat shown in Fig. 3. The top slab is made 3 in. thick, 20 in. wide, and 5 ft. long, by the process described for the first seat. The supports are 4½ in. thick, and in their simplest form may be made with a cap and base effect, on the edges only. The working drawings and sketch show pilasters, ½ in. thick, on the outer sides, produced by paneling the surface. The detailed construction of the form for the supports is shown in Fig. 7. Make the form with inside dimensions of 15½ by 18½ in. Make two strips J, ⅝ in. thick, with a ⅜ by 1⅝-in. rabbet at the upper

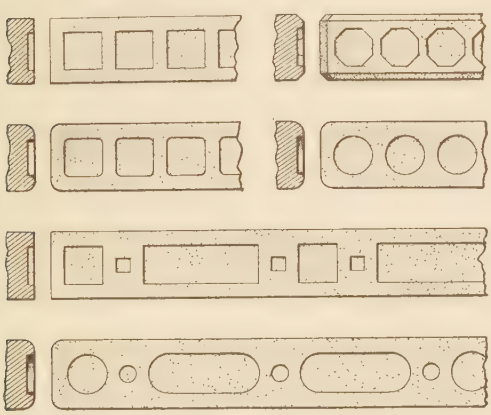


Fig. 6

Several Panel Treatments of the Edges, the Panels and Corners Designed to Harmonize in Each Case

end, and nail them to the sides of the form, as shown. Make a piece ½ by 8¼ by 15½ in. for the panel mold. Rabbet the upper corners ⅜ by 1⅝ in., and the lower ones ⅝ by 3½ in. Bevel the edges on the sides and at the rabbets to give draft. Nail the panel carefully into place in the bottom of the mold, centering it to make the pilasters of the columns each 4½ in. wide. Fix the sides into place with screws. Round off slightly all sharp corners, and set the nails, filling the holes with plaster of Paris. Smooth the inside of the mold, and clean, shellac, and oil it. Set the bolts that join the top slab and the support into the upper end of the form, and the mold is ready to be poured. Fill the mold with a 1:3 mixture of Portland cement and

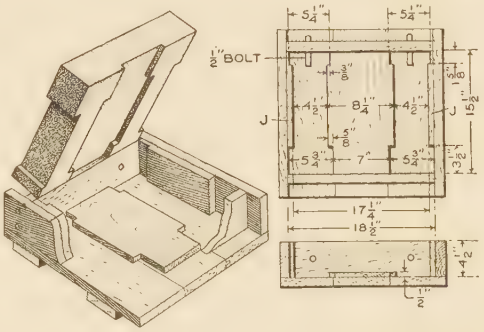


Fig. 7

The Form is Built Up Accurately and the Mold Poured. The Sides of the Form are Removed, the Support being Shown in Diagrammatic Relation to the Form Only

coarse, clean sand, and proceed in general as in the making of the slabs for the first seat.

Tinting a Cement House

It frequently happens that in building a concrete house the cement will show in several colors or shades after the job is finished. It may be desirable to tint the entire surface of a uniform color, that shall not be paint, but practically a part of the house itself. This result may be secured by washing the whole house with cement, but there is a trick in doing this properly that is not always understood. The cement wash is made by mixing two parts of Portland cement and one part of marble dust with enough water to reduce it to about the same consistency as whitewash, and is applied with a whitewash brush. The wall must be thoroughly wet with water for several hours before the wash is applied, and kept constantly wet during the application, and for at least a day afterward. The important thing to remember is that the wash must not be applied to a dry wall, as it will not adhere. The result will fully justify the cost.

A GARDEN FOUNTAIN AND BASIN OF CONCRETE

by Herman E. Nichols

A SIMPLE home garden may be lifted out of the commonplace and given something of the atmosphere associated with the large estate or country place by the addition of a small fountain, in keeping with the surroundings. Spraying water and a glistening pool lend a charm to the home grounds, of which the householder may well avail himself, since the expense is comparatively inconsiderable, and the work may be undertaken, for the larger part, by the novice. A fountain and basin, designed with these considerations in mind, is shown in the illustrations, in actual use. It was constructed at a cost of $10 for materials and labor not performed by the owner.

Concrete is a substantial and economical material from which to construct a fountain, and has the added advantage that it may be handled with reasonable success by a careful person not specially skilled. It has possibilities of adaptation to a great variety of designs and methods of construction. This is a desirable feature, since many persons may wish to adapt the design shown to their own needs or artistic and constructive skill. The circle, square, diamond, oval, octagon, or more complicated figures, may be taken as the basis for a design, and "pick-up" materials about the home may be used to develop the forms for the concrete.

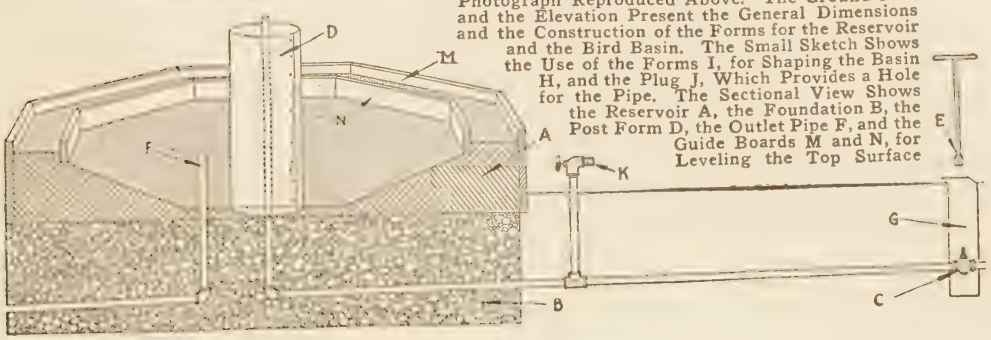
No attempt was made to finish the surfaces of the fountain, as the rough-cast effect is satisfactory and harmonizes well with the simple, substantial lines and construction. Other finishes, with inset designs, panels, etc., may be made to accord with the design and decoration of the home, or the formality of the garden.

A water supply is, of course, essential, but this should not offer serious obstacles, though it is a phase of the construction that had better be handled by a mechanic. A city water supply offers a ready solution. A spring with sufficient pressure to throw the water two feet above the upper surface of the fountain is also satisfactory. Where the fountain is to be connected with a private water-supply system, it is desirable to provide a tank set high enough to give the fountain spray pressure. The quantity of water necessary for the fountain described is less than that used by the average lawn sprinkler, and, like the latter, it may be turned on and off, or the size of the flow regulated, as desired. The water in the reservoir may in some instances be used for other purposes, such as watering flower beds or the garden. If the garden is protected, small fish may be kept in the reservoir.

The fountain, as shown in the illustration, consists of two main parts, the reservoir below and the dished bird basin, from the center of which the spray flows. The design is based on the octagon, the layout of which is shown in the small ground plan and elevation at the top. The details of the water supply, the casting and finishing of the reservoir, and the making of the basin are shown below in the sectional diagram and the sketch.

The water-supply pipes and the drain to remove the excess water from the reservoir should be provided and fitted into place before the construction of the fountain proper is begun. The supply pipe should be ½ in., and the outlet pipe ¾ in. The outlet pipe should extend to within an inch of the upper edge of the reservoir. It should be turned from time to time while the concrete is setting, in order that it may be removed when it is

The Effectiveness of This Inexpensive Fountain for the Home Garden is Brought Out Strikingly in the Photograph Reproduced Above. The Ground Plan and the Elevation Present the General Dimensions and the Construction of the Forms for the Reservoir and the Bird Basin. The Small Sketch Shows the Use of the Forms I, for Shaping the Basin H, and the Plug J, Which Provides a Hole for the Pipe. The Sectional View Shows the Reservoir A, the Foundation B, the Post Form D, the Outlet Pipe F, and the Guide Boards M and N, for Leveling the Top Surface



desired to drain the reservoir for cleaning or for the winter.

When the pipes are arranged, the foundation of grouting, B, may be laid. Care must be taken that the supply pipe is centered properly. The grouting should be about 10 in. in depth, and of a mixture of 1 part cement, 3 parts sand, and 6 parts gravel, or crushed rock. In order to make the foundation of the same shape and only slightly wider than the main portion of the fountain, it is desirable to make the frame for the outer faces of the reservoir, as shown in the ground plan and elevation, before laying the foundation. The frame may then be used as a guide, although the octagon may be laid out on level ground, and, by careful digging, the sides of the hole may be used, without boards, as the foundation limits.

The form for the reservoir should be made very carefully, as upon its accuracy will depend the symmetry of the fountain. First make a frame of 6-in. boards, inclosing a 4-ft. square, as shown in the ground plan. At the middle of each of the sides lay off a distance of 20 in., centering it, and making the measurements on the inner sides of the frame. Fit pieces into the corners, having braced the square frame against being forced out of shape. Make three pieces of 1½-in. strips to form a mold for the inner octagon. The pieces are 16⅜ in. long on the outer surface, and should be mitered carefully, and nailed at the joints. To hold the form in its proper shape, place it inside of the outer form, and set it to provide a space of 4 in. between them. Nail braces to the inner form, and, when using the latter, separate it from the outer form the necessary distance with braces, and level its upper edge with that of the outer form.

Fix the outer form into place on the foundation. A mixture of 1 part cement to 3 parts of sand is used in all of the remaining concrete construction. Pour in the mixture, tamping it down, and shape the material roughly to the cross section shown in the sectional view. The thin part of the reservoir near the middle is 1½ in. thick. When the concrete has been heaped up sufficiently at the sides, set the three-section inner mold into place, and level off the upper surface of the sides, on the outer and inner molds, as at MN. Transfer the inner mold and complete the rim all around the reservoir. Smooth off the interior, sloping it evenly and making the floor flat. It is important that the outlet pipe be turned repeatedly at this stage so that it will be removable when the concrete is dry. The forms may be left in place temporarily as a protection.

The support for the bird basin may be poured next. Form a sheet of galvanized iron into a cylinder with an inside diameter of 6 in. and a height of 15 in. Set this over the center of the reservoir and pour the concrete into it, leveling the mixture off at the top of the cylinder. The supply pipe should be plugged during these operations in order to prevent particles from clogging it.

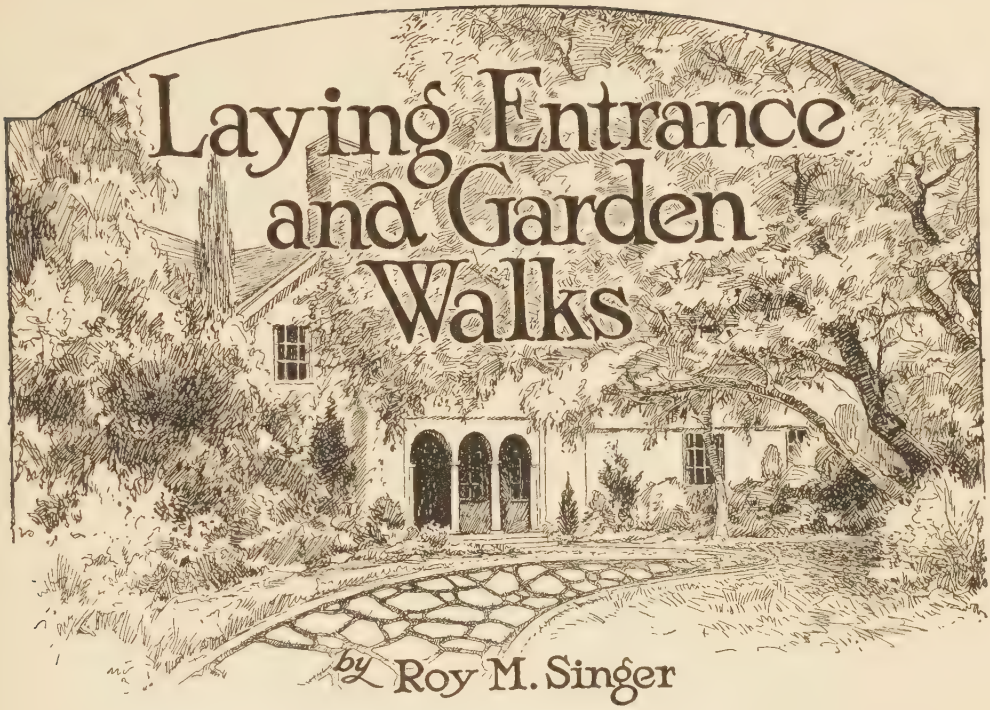
The bird basin should be made on a board table, as shown in the small sketch above the sectional view. It may be made by fixing the 3-in. pieces I, making up the form, to the table, or by building up a form similar to the outer form for the reservoir, as shown in the ground plan. The latter method is preferable, particularly for the novice. Pour the concrete into the form and smooth off the upper surface even with the upper edges of the mold. Form the dish in the top, 1 in. deep, with a trowel. The center hole, through which the supply pipe is to fit, should be provided for by inserting a wooden plug, or a short section of pipe of proper diameter, into the center of the mold, and turning it while the concrete is setting. When the proper time for drying has been allowed, the bird basin may be set into place and the molds removed. Rough corners or leakage roughnesses may then be cut away.

It may be noted in the sectional view that the supply pipe was provided with a stopcock, C, set into a chamber, G, so that the water may be regulated with the wrench E. A tap, extending from the supply pipe, may be used to supply water to a garden hose, at K.

The material and other costs for this fountain as constructed were as follows: screened sand, ½ yd., 75 cents; two bags cement, $1; piping, $2.25; labor, $6. Gravel for the concrete used in the foundation was obtained without charge.

Submerged and Exposed Concrete

Concrete laid under water will set much better than concrete laid in air. This is due to the fact that a far better hydration of the lime results in submerged work than in ordinary work, where the concrete dries out quickly. Work that is exposed to air, such as walks and driveways, should be kept covered for several days with old wet carpet or canvas, or even with moist earth, to prevent it from drying out too quickly.



Laying Entrance and Garden Walks

by Roy M. Singer

ONE of the main features of a home is the walk leading to the entrance door. It is the first thing that meets the eye of the person entering. If the walk is neat and well kept, the impression is bound to be fair; if it is poorly laid and ill maintained, the impression is likely to be a bad one, notwithstanding the fact that the exterior of the house may be beautiful. Not alone the front but also the side walks and the garden walks, if laid in an attractive manner, will go far toward making the house good to look at.

It must be said at the beginning that the main purpose in writing this article is to show how to construct a well-built walk other than the ordinary concrete sidewalk, and to illustrate various patterns and different materials which may be used to good advantage.

The materials for the construction of a decorative walk depend a good deal upon the location of the town in which the walk is to be built. For example: in certain towns slate is available. in others it is not; in some brick may be purchased at a very reasonable figure in others it will be found to be quite expensive. Thus, where cost is an important factor—and it generally is—the material should be selected from among those most readily available in the town.

There are four materials which lend themselves to decorative-walk construction, and they are stone, brick, tile and concrete. With stone, some very attractive walks of the flag-type may be built. Flag walks are of a rather informal appearance when laid with wide joints so that the grass grows between the stones, and are more suitable for gardens than for the front walks to homes, but where a rustic effect is desired, such as the walk for an English-cottage-type house, set in rather heavy foliage, nothing blends into the picture so well as a flag walk with the flags about an inch apart and grass growing between them.

Brick and tile present a more formal or citylike appearance than stone, although brick may be laid with wide grass-grown joints to give a garden-walk effect. It is more often, however, laid in a simple pattern and the joints filled with cement grout. Ordinarily the joints in brick walks are not greater than 3/16 or 1/4 in., although when a grass-grown brick walk is desired the joints should be at least 3/8-in. wide but not more than 5/8 inch.

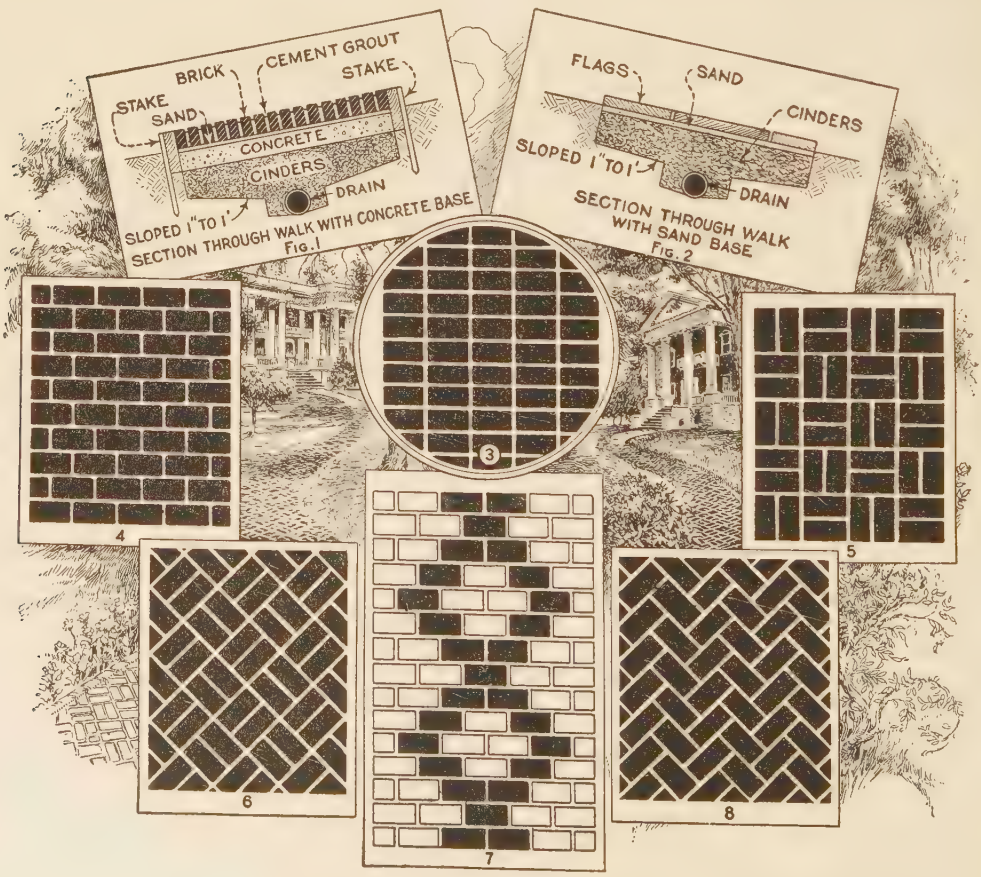
Tile used for walks is of the kind known to the trade as quarry tile. It is not quarried, however, as its name might indicate, but is made of burnt clay in the same manner as brick. It comes in sizes ranging ordinarily from 4 by 4 to 8 by 8 in. It may sometimes be had in larger sizes than 8-in. squares, but seldom smaller than 4 by 4-in. The thickness may vary from 1/4 to

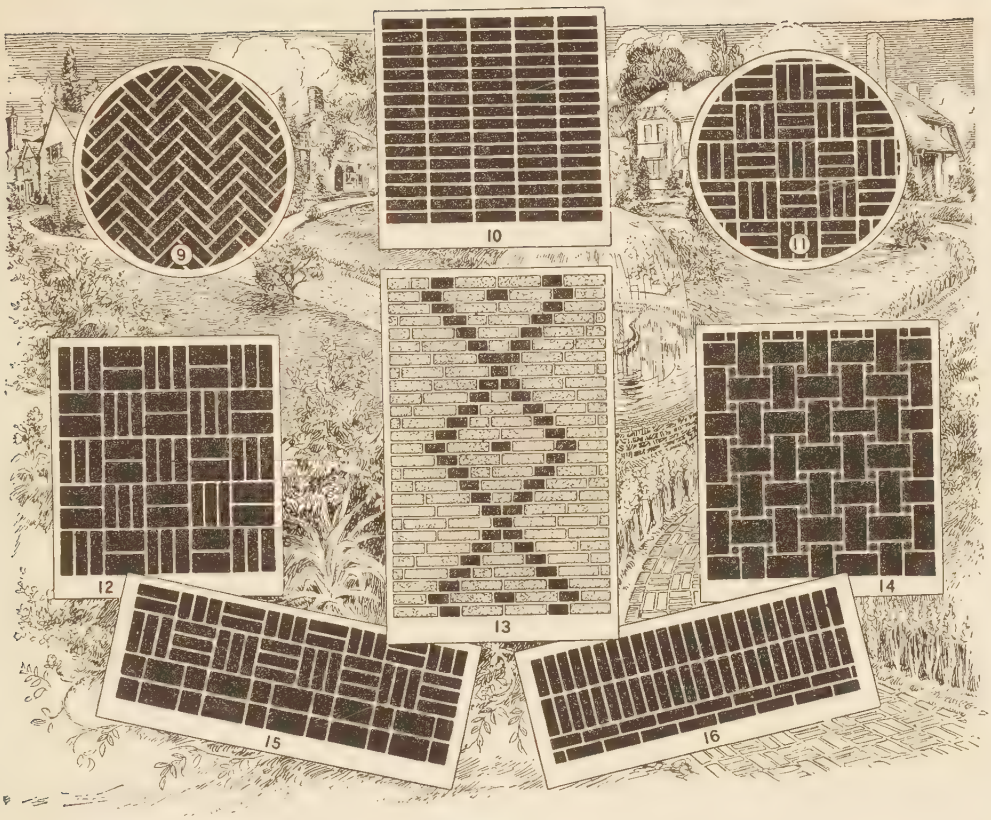
1 in. depending upon local kiln practice.

Concrete is a good material for ornamental walks in that it may be used to make concrete flags or tile, and thus this material may be used in localities where the genuine is not available. One advantage of concrete is the fact that it can be had everywhere. With concrete flags a very attractive effect may be obtained by coloring the pieces. All that is necessary is to add some mortar color to the mixture when it is made up. A varicolored walk may be built up by using units of several tints. This makes a very attractive walk provided the colors are subdued and blended harmoniously.

We will first take up the construction of a walk, of which there are two main types, that with a concrete base, and that without. Where climatic changes are considerable no walk should be built without a concrete base, lest it be destroyed by being uplifted due to the action of frost; but in warm climates, where heavy frosts are not encountered, the concrete base may be dispensed with.

Fig. 1 shows a section through a brick walk with a concrete base. Brick walks, by the way, should always be built with a concrete base. Some change in the surface due to settlement is bound to occur in time if they are not. The first step in the construction of a walk is to excavate the top soil to a depth of about 10 in. so that a firm base for the walk may be obtained. The surface should then be thoroughly tamped to make it solid. In the center of the walk a line of drain tile should be placed, if the ground is low and the drainage poor. In high ground, where the natural drainage is good and the soil fairly sandy, the drain need not be installed but it must be used where natural drainage is poor and the soil is clayey. It is better to fill the pocket in which the drain tile is set with gravel than with cinders, as is sometimes done, for the gravel will let the water seep through to the drain tile easier than will the cinders. Notice in the sketch that the bottom of the





excavation is sloped toward the pit in which the drain is laid. This slope should be about ¾ or 1 in. per foot.

After the drain is installed, the excavation should be filled to a depth of 6 or 8 in. with cinders, well wetted down and tamped firmly and solidly Next the concrete base is applied between the forms, as shown in the sketch The forms consist of 2 by 4-in. lengths held in place by stakes. The stakes are made high enough so that an additional 2 by 4-in. piece may be attached and used as a guide for laying the brick. The concrete used should be a 1:3:5 mix, and should be allowed to set for 24 hours before the brick are laid upon it.

Before beginning to lay the brick, a thin layer of fine bank sand, about ⅛ to ¼ in. thick, should be spread on the concrete. This sand cushion will take up all the little unevennesses in the surface of the concrete and make the laying of the brick easier, in addition to providing a cushion for the walk. The brick are laid to the desired pattern on the cushion of sand, and the joints are then filled with grout. This grout is made by mixing one part of Portland cement with one part of fine bank sand and adding enough water to make the mixture flow easily. In filling the joints take care that any grout lying on the edge of the brick is quickly removed with a wet rag, for after it sets, it will be difficult to scrape off and the walk will not look well. At intervals of about 18 or 20 ft., the joints should be filled with tar or asphaltum in order to provide an expansion joint. Another way of grouting a walk would be to fill the joints with a dry mixture of cement and sand, and then sprinkle it with water. The first method is to be preferred, however, for, though it requires a bit more care to pour the grout than to pour the dry mixture in the joints, the effort is well repaid by the assurance that the entire joint is filled with concrete instead of the possibility of having the top half filled with concrete and the bottom half with a dry powder.

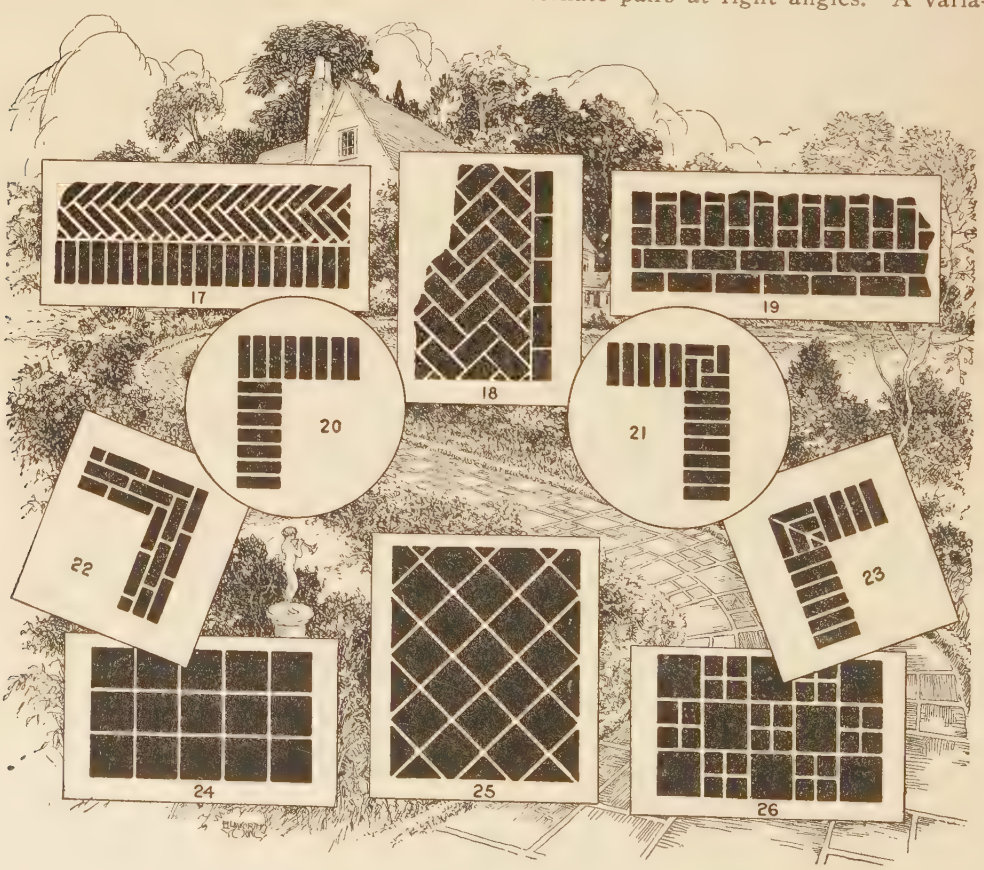
Where walks are laid without a concrete base, the construction is shown in Fig. 2. This is practically the same as

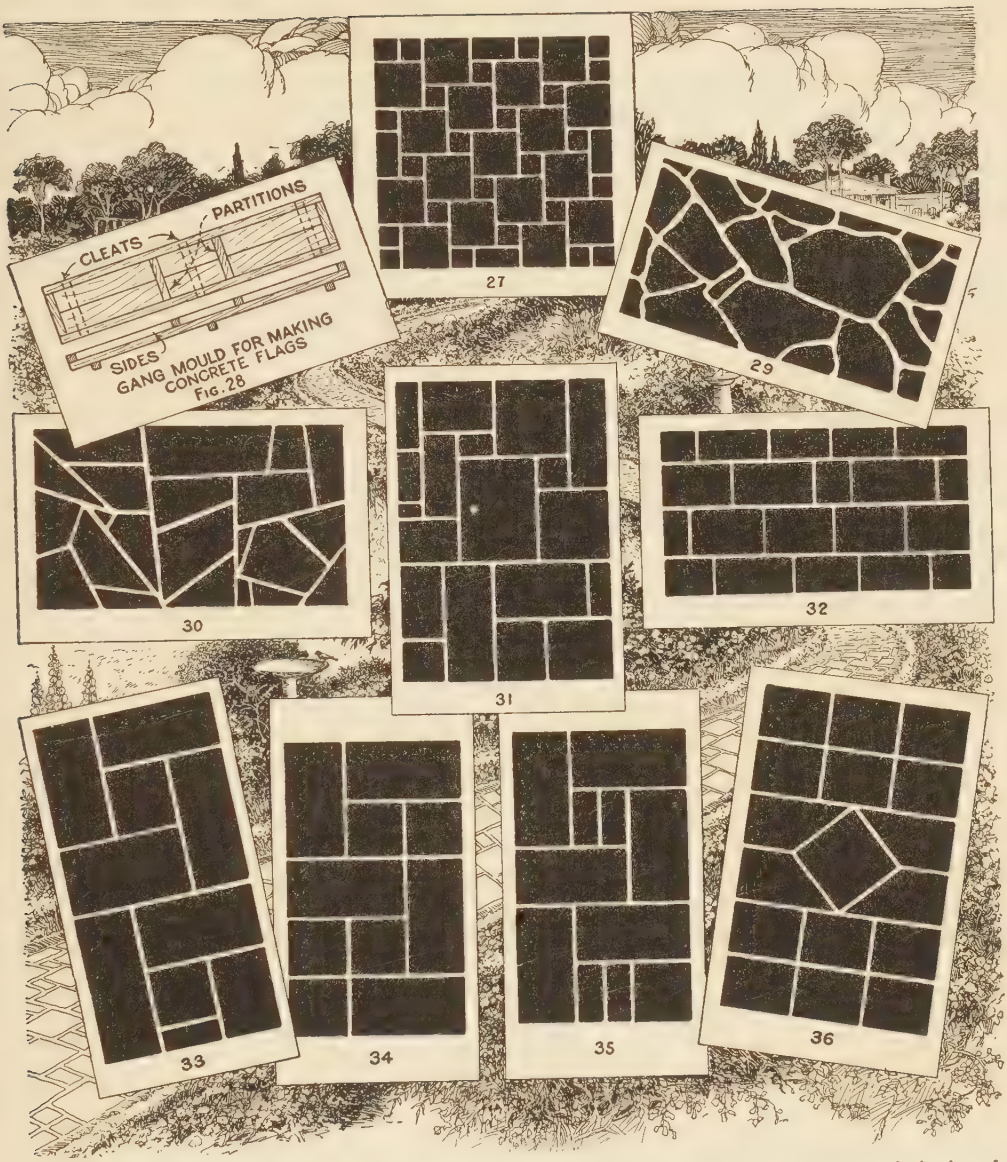
for the construction with the concrete-base walk except that the concrete is omitted and the sand cushion laid directly upon the cinders. The sand cushion should be made ½ to 1 in. thick. Walks with only a cinder base are not grouted but are intended for use where it is desired to allow grass to grow between the joints in the walk.

Many beautiful patterns may be laid in brick walks. Brick lends itself especially to pattern work due to the proportions of the units, the ordinary building and paving brick being about 2 in .thick, 4 in. wide, and 8 in. long. Thus, allowing for a mortar joint of suitable width, two thicknesses of brick make one width and three thicknesses make one length. Thus, various arrangements of width, thickness and length may be made. There are two ways of laying brick walks; the first with the brick flat, and the second with the brick laid on edge. Laying the brick flat, fewer brick are required for a given area than setting the brick on edge, but the laying will be found slightly harder. Flat-laid brick adapts itself better to wide, grass-filled joints than does brick laid on edge. It may be taken as a commonly accepted rule that brick laid on edge should always be laid on a concrete base, and the joints filled with cement grout Brick laid flat, however, need not have the joints grouted. A good width for the ordinary front walk is about five bricks wide, or approximately 42 in. A four-brick-wide walk (about 33 in.) may also be used if the first width is too great. Garden paths and winding lanes through shrubbery may be made three bricks wide.

In Fig. 3 is shown the southern style of walk. This consists of brick laid flat in a regular pattern. In Fig. 4 is shown a variation of the southern style, which calls for the breaking of the joints in each row. The brick could also be laid with the length of the brick parallel to the length of the walk, instead of perpendicular to it as illustrated.

Fig. 5 illustrates the hearth pattern. Here two bricks are laid parallel, with alternate pairs at right angles. A varia-





tion of the hearth pattern is shown in Fig. 6. This consists of laying the brick at an angle of 45° with the border of the walk instead of parallel to it. In this, the brick at the edge of the walk must be cut in order that the line at the edge of the walk be preserved. Fig. 7 is the same pattern as Fig. 4, except that a diamond design is worked into it by the use of different-colored brick. In laying a walk in this pattern it is not well to have too great a contrast between the brick colors. If the two colors are just different enough so that the diamond design is only slightly discernable, the best effect will be obtained.

The herringbone pattern shown in Fig. 8 is a neat one, and is quite popular. It is comparatively easy to lay and less cutting is required than for the design shown in Fig. 6. In Fig. 9 is shown the herringbone pattern with the brick laid on edge. Laid on a cement base, this pattern with the joints grouted, provides an especially strong and durable walk.

Edge-laid brick, illustrated in Fig. 10, makes an easily built and strong walk.

The brick can also be laid with the joints broken, as shown for the flat-laid brick in Fig. 4. In Fig. 11 is illustrated the basket-weave pattern, somewhat similar to the hearth pattern shown in Fig. 5, except that the bricks are laid on edge, and that three bricks are used instead of only two. Fig. 12 is a combination of the basket-weave and the hearth pattern. Fig. 13 shows a diamond design worked into an edge-laid walk. A little study will show that this design differs considerably from the diamond design shown for a flat-laid walk in Fig. 7. A combination brick and tile walk is illustrated in Fig. 14.

In some cases, it is desirable to have borders for the walks, not only for the added decorative effect, but because, with the pattern used, small pieces are left at the edge and a border is required to hold them in place and prevent their being chipped out. Thus, while the design shown in Fig. 14 would not require a border, that illustrated in Fig. 9, the herringbone walk with the brick laid on edge, would need a border in order to keep the small triangular filler pieces from being knocked off the edge Figs. 15 to 19 illustrate borders of various designs which may be used. Figs. 21 to 23 show various ways of building up a corner in a brick walk.

Some patterns for quarry-tile walks are shown also. Fig. 24 illustrates a walk with the joints laid regular. A variation of Fig. 24 would be to break points similar to the manner used in the flat-laid brick walk shown in Fig. 4. Fig. 25 shows a walk with the tile laid at an angle of 45° with the edge of the walk. This is a pleasing design but the cutting of the tile for the edges is quite a task, and a good many will be wasted due to their failing to cut properly. In Fig. 26, two different sizes of tile are used, as is also the case in the pattern shown in Fig 27. As a great many sizes and colors are obtainable in this material, some very beautiful patterns and color schemes may be worked out. It should be borne in mind, however, that of the several types of walk described in this article, those built of quarry tile are the least durable, and are more suited to interiors and semi-protected places than to the open spaces where they may be subjected to the continuous action of the elements.

Perhaps the most decorative walk of all is that made of flags. Flags are large stones about 10 by 24 in., or thereabout, although they may run in size from 6 by 8 to 12 by 36 in. They may be laid on a cinder-and-sand base without fear of great distortion, and they appear particularly attractive when they are laid about 1 in. apart with grass between the joints. In some localities stones of different colors are obtainable and they may be used to advantage in laying a walk in a desirable color scheme. A combination of reds and browns, or greens and blues, or any other colors which do not clash, is very pleasing.

Where stone is not readily obtainable, concrete flags may be made. A gang mold for making concrete flags is shown in Fig. 28. Here three flags can be made at a time, two large and one small, although the number, size and shape may be varied to suit the requirements of the job. The mold consists of two planks fastened together with cleats to form the bottom, and enough cleating nailed around the edges to give the desired shape and size The flags are molded in the same manner as any other kind of concrete casting. They should be about 3 in. thick, and it is well to reinforce them with chicken wire, especially the larger sizes. When applying the wearing surface, color effects may be obtained if a little mortar color is added.

Fig. 29 shows a walk built of field stone; this is, as its name implies, a walk built of stones of random sizes and shapes, fitted together in a kind of crazyquilt pattern. The stones are laid with rough edges, just as they are picked up in the field. This is an ideal rustic walk for heavily wooded places. Fig. 30 is a similar walk with the edges cut to a line. The walk shown in Fig. 31 is what is known as random rectangular, that is, the stones are rectangular in shape but of random sizes, and are fitted together as shown in the pattern. A variation of the random-rectangular pattern is shown in Fig. 32. Here the stones are of one width in the respective rows, but of varying lengths. Figs. 33 and 34 show designs obtainable by the use of flags of two different sizes, and in Fig. 35 is illustrated a walk involving the use of three different sizes. Fig. 36 is a diamond pattern which may be worked into a flag walk somewhere along its length or at a crossing.

There are an infinite number of patterns for the different materials mentioned in this article. Anyone with just a little ingenuity can develop a host of patterns, using those illustrated as a basis upon which to work.

CONCRETE GARDEN FURNITURE

BY JAMES TATE

Part I—Flower Boxes and Vases

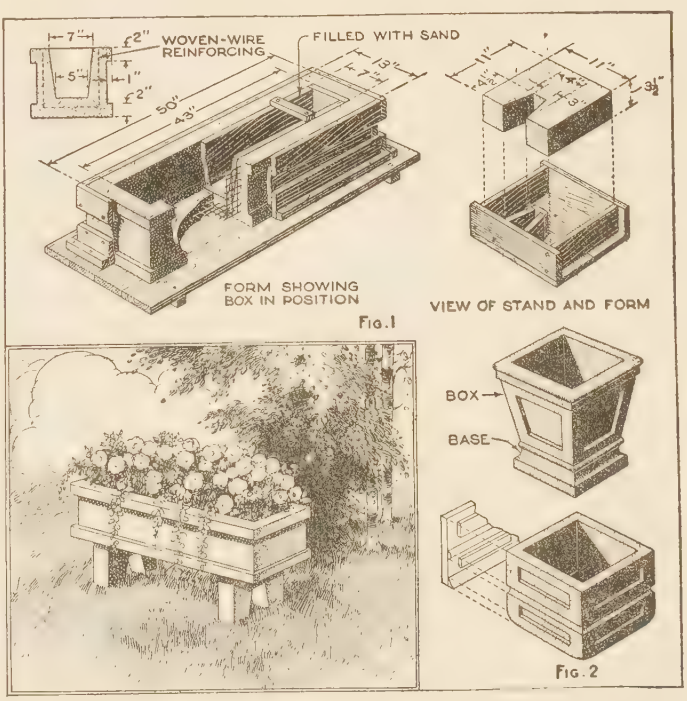
PERMANENT flower vases, urns, and boxes of concrete are easily made by the home worker. The materials required are not expensive, and, by choosing simple designs, and exercising reasonable care, many pleasing effects may be secured.

The easiest method of molding a simple flower box is by using a wooden mold. This is built as shown in Fig. 1, 1-in. boards being used for the form. The form is made like a box without top or bottom, and is placed on a foundation board, being held in position by a cleat screwed to the board, at each end of the form. The interior of the form should be oiled or greased, or at least well wetted, before any concrete is placed in it.

When filling the box form, first place a 1½-in. layer of concrete in the bottom, then put in the reinforcing; this is ½-in. mesh, No. 20 galvanized-wire lath, and is procurable at most hardware stores. It is bent up on the sides and ends as indicated. Next fill in more concrete so that the bottom is about 3 in. thick. The inside form is then placed in position, centered, and filled with sand, to prevent its collapsing under the pressure, and the remainder of the concrete poured. The concrete used throughout this job should be a mixture of one part cement to two parts sand. The pouring of the cement in the stand form is performed in a similar manner, except that the reinforcing may be omitted, if desired.

Remove the forms in about 24 hours and paint the pieces all over with a cement and water mixture. To erect, place the stands in position at the proper distance apart, and set the box on them, using a mortar of cement to bond the stands to the box bottom.

Simple vases, square or rectangular, without stands, of designs similar to those shown in Fig. 2, are made in forms as described for the making of the box. The panels in the upper design are made, as indicated for the lower one, by blocks of



Simple Boxes or Vases of Rectangular Section Are the Easiest Forms for the Beginner. They are Cast in Wooden Molds, Which may be Used Repeatedly. Figure 2 Shows How Panels are Made by Blocks Nailed to the Form.

suitable size nailed to the form. Molding, half-round or quarter-round, may also be utilized in forming rounded sections on the pieces.

There are several methods of making vases and urns having curved outlines; this article will, however, be confined to the simplest methods and designs, while more elaborate methods will be taken up in succeeding articles.

The easiest method of making a vase such as shown in Fig. 3, is by means of a template, or "sweep," and the first step consists in making the core that forms the inside of the vase. The vase itself is shown half in section and half in elevation in the upper left-hand corner.

First make the foundation board. This should be of 1-in. lumber, well braced, and about 2 ft. 6 in. square. An old door will answer, if the surface is perfectly flat and the joints tight. In the center of the board, screw a ½-in. floor flange, and into the flange a length of ½-in. pipe, cut to the same length as the intended depth of the core. The top end of the pipe is fitted with a hardwood bushing, drilled to receive a pin on the template. The template is made of ¾-in. boards, as shown, cut to the required taper of the core, and faced with a piece of galvanized iron, projecting ⅛ in. from the edge of the template. This forms a cutting edge, and the template is beveled back of it, as shown in the section A-B. Exactly at half the core diameter, as measured from the edge of the galvanized iron, either drill a hole in the edge of the template and drive in a pin to fit the hole in the pipe bushing, or fasten the pin by means of a strap and by bending the galvanized iron over it, so that the center of the pin is exactly on the edge of the template. The latter is the better method, and is the one shown in the drawing. In order to economize cement, build up around the pipe, which is first coated with oil or grease, with broken rock, bricks, or any similar material, bonding them with a little cement, if necessary. This should form the bulk of the core. Then mix one part cement with two parts sand as before, drop the template into place, give it a turn to see that none of the rough core strikes it anywhere, and proceed to lay on the cement.

This should be liquid enough to percolate through the stone mass, but not thin enough to run all over the board. Plaster it well over the sides, building from the bottom upward, and as it comes near the required diameter, commence turning the template around; this will form the surface. The template must be pressed to the foundation board, which should be kept clean. During the last stages, thin the concrete a little, and pour it over the core from the top, always keeping the template on the move, and keeping the edges of the latter free from hardening cement. The finished core should be left on the board until thoroughly dry, and then be given two or three coats of shellac.

While it is drying, proceed to make the template for the outside of the vase. This is made in a similar manner to the one for the core, half the pattern of the outside being used, and, as the galvanized iron forms the true template, too much care need not be taken in cutting out the wooden frame.

Unscrew the pipe from the core and screw a longer one into place, the exact length of the vase, lifting off the core, if necessary, before unscrewing the pipe. When the shellac has hardened on the core, give it a coat of paraffin, or heavy oil. Plaster on concrete until it is as heavy as half the desired thickness of the wall, then place the previously prepared reinforcing on the concrete. This reinforcing should be placed so as to support the overhanging portions of the vase, such as the base, and may be prepared in either of the two ways shown in the drawing. One side of the reinforcing shown is made of twisted galvanized wire, the other is made of wire lath, such as used for the flower box in Fig. 1. The drawing is made as shown merely to illustrate the two methods of reinforcing, and must not be followed literally. If wire mesh is used, make the entire reinforcing of mesh, bracing it with hoops made of wire, and similarly with the twisted-wire reinforcing, which may be held to the hoops as illustrated in the enlarged detail.

Spread the concrete over the reinforcing and proceed to build upward, dropping the template into place as the diameter approaches the desired size, and keep on building and turning the template as described for the core. When nearly completed, thin down the concrete with water until it is more pasty than before; this will smooth up better and make a somewhat finer surface.

Instead of the pipe as a center support, a piece of 1-in. square hardwood, tenoned into the base, may be used. This is shown in the lower right-hand corner of Fig. 3. The pipe is a little more substantial; the results obtained by using either support will, however, be the same.

If any difficulty is met with in making the base, that is, if trouble is encountered

The Various Tools, Forms, and Methods Used in Making Circular Urns and Vases by the Template Process are Shown in Detail in This Illustration. The Designs Chosen are Well Adapted to This Process, the Square Bases Shown in Designs B and C, Figure 4, being Cast Separately in Simple Wooden Molds. Figures 3 and 5 Show Alternative Methods of Using the Templates, the Only Difference Being in the Method of Application

in holding the concrete up while forming, it may be made separately, as shown in Fig. 6. The main former or template will then be as at B, the base template as

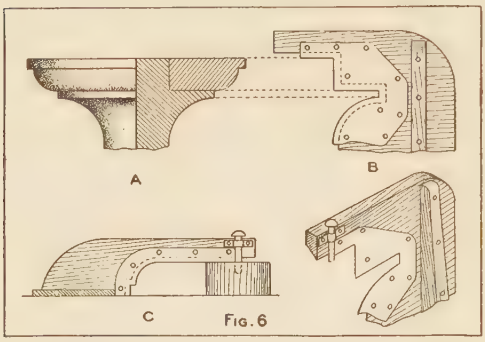


Fig. 6

One Method of Forming the Base, Where Difficulty is Encountered in Making the Vase in One Piece

at C, the hole in the base being formed by a circular block of wood, in the center of which the pin turns. The base and vase can afterward be joined as shown at A by a good cement mortar.

Figure 4 shows a number of pleasing, yet simple, designs. The square bases of B and C may be cast in a wooden box mold, being assembled as shown at F.

Another method, especially applicable to designs such as shown at E, Fig. 4, consists in rotating the work against a stationary template. A wire-mesh frame is made, upon which is plastered a roughing coat of one part cement to two parts sand, together with some plasterers' hair. The hair can be purchased at any plasterers' supply house. Do not get the mixture too wet, just wet enough to squeeze through the holes in the wire mesh. Cover both sides and bottom of the frame, leaving the surface rough; then let the cement set.

A good mixture for the finishing coat consists of one part cement to two parts marble dust, mixed to a heavy paste.

The cement-covered form or frame is placed upon the center of the turntable, as in Fig. 5, and a nail is driven through the work and into the table; next, the template is moved up into contact with the turntable and fastened by means of pegs, then the finishing coat is plastered on, all the while rotating the table, and with it the work. Before putting on this coat, rough up the first coat with a sharp-pointed tool, and wet thoroughly.

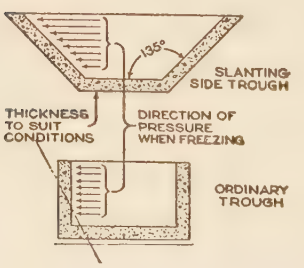
When the outer surface has been formed, a horizontal piece of wood, edged with galvanized iron, is bolted or screwed to the template at the proper height, and the top edge of the vase trued, then another piece, to form the inside of the vase, is attached to the horizontal strip, as shown in the drawing.

The bottom may be trued by holding a piece of wood as shown, and revolving the work.

The finishing coat, of cement and marble dust, spoken of in connection with the last example, may be used with any of the pieces made by the template method. This forms a surface that is light, and full of sparkle when dry, presenting a very pleasing appearance.

Concrete Trough That will Not Burst When Frozen

Concrete water troughs and tanks which have upright sides are nearly always damaged when water freezes in them. The reason for this is that the pressure caused by the freezing exerts its total force horizontally against the walls and pushes them outward. A trough made with slanting walls, as shown in the drawing, is much less liable to burst, since the pressure is exerted over a much larger area, and part of it tends to push the ice upward. The side walls should meet the bottom of the trough at an angle of about 135°. Very large troughs or tanks made in this way need not be emptied, as they practically never break from freezing; for large tanks, the angle need not be so large.



Footstool for Cement Floors

A clerk finding the cement floor of the office uncomfortably cold to the feet, devised a footstool in the following manner: A shallow box was procured, and four small truck casters were fastened to the bottom. A piece of carpet was laid on the inside of the bottom, and some old newspapers placed on top of it. When seated at the desk, he placed his feet inside the box on the papers. The casters elevated the box high enough to avoid dampness and cold, and permitted an easy change of position.—L. Alberta Norrell, Gainesville, Ga.

BY JAMES TATE

Part II—Pedestals and Bird Baths

THE methods of making wooden forms described in Part I, and illustrated in Figs. 1 and 2, may also be used in making the vase and pedestal shown in Fig. 7.

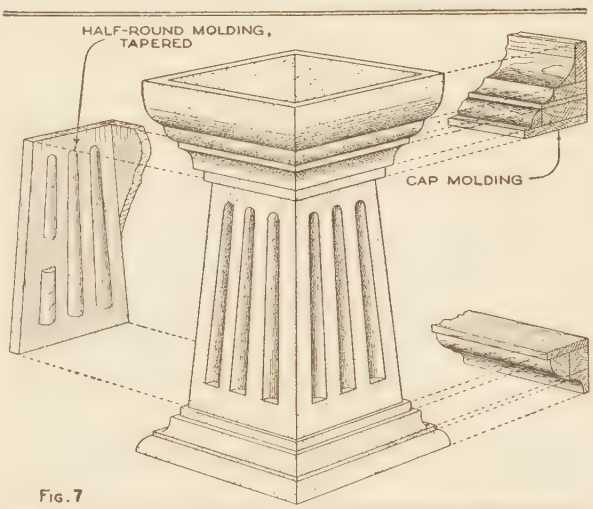
The forms for the top of the pedestal, or capital, and for the base, may be built up of molding sections, as shown; these moldings can be procured from any dealer in millwork; some forms of cap molding or plate-rail molding come in the shapes illustrated; if these are not easily obtainable, the form may be built up of simple sections; half-round molding, tapered and nailed to the sides of the pedestal - body form, will form the grooves.

The pedestal, base, and vase are preferably reinforced with wire mesh, and the pedestal may, by using a tapered wooden core, be cast hollow, thus saving material.

The whole piece may be cast as a unit, if desired, but if the cap, base, and pedestal are cast separately, they should be formed as shown in Fig. 6; this makes the unit much more solid than if the ends were merely left flat.

A number of designs for sundial pedestals and bird fountains are shown in Figs. 8 and 10. The bases and square capitals are cast in wooden molds, or made as shown in Fig. 11, by means of a template working on the edge of a box.

A square bottomless box, of the desired size, is placed upon the foundation board; a template is cut from galvanized sheet iron, to the proper shape, and fastened to a wooden guide, as indicated. After the cement has been placed in the box, the template is moved along each side in turn, the material scraped off being carefully removed. This method may, of course, be applied also to the making of the caps and base in Fig. 7.



Wooden Molds for Pedestals and Vases may be Built Up by Using Cap Molding or Simple Moldings, as Shown in This Illustration

A simple method of placing the pedestals on the lawn is indicated at B, Fig. 8. A hole is cored in the base of the pedestal; when it is set in position, a post, driven into the ground and a neat fit in the pedestal hole, will hold the unit firmly in place.

The sundials used with the pedestals illustrated are not usually fastened in place, their weight being sufficient to hold them in position, but for light dials, or where a permanent fastening is desired, four small holes may be made in the cap by inserting shellacked and oiled plugs into the soft concrete. The dial is then mounted as suggested in Fig. 9, the holes being filled with neat cement.

Little need be said about the bird bath and fountains shown in Figs. 10 and 12,

except that the fountain in Fig. 10 and the pedestals of Fig. 12 should be made by the method shown in Fig. 3, Part I, while the small bird bath, the top of the table, and basin of the fountain in Fig. 12, can best be made by the fixed-template method illustrated in Fig. 5, Part I.

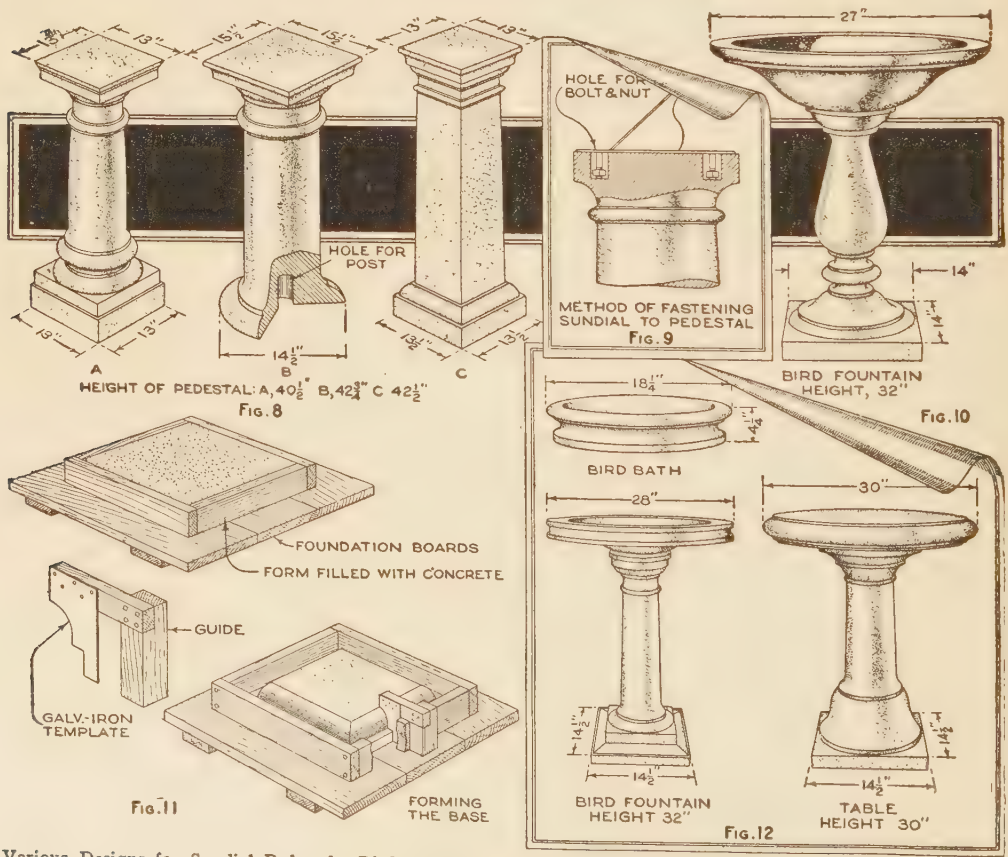
Where a vase, pedestal, bird bath, or any similar article is already at hand, and it is desired to duplicate it, the best method, if the design is not too elaborate and has no undercut portions, is to make a plaster mold.

The making of plaster molds for elaborate pieces demands a great deal of experience. We will, therefore, choose only such designs as can easily be made by the amateur, commencing with a simple rectangular vase.

The vase shown in Fig. 13 can be made in a wooden mold; in fact, it would be advisable to make it this way, but it is convenient for illustration, and as a simple exercise for the beginner.

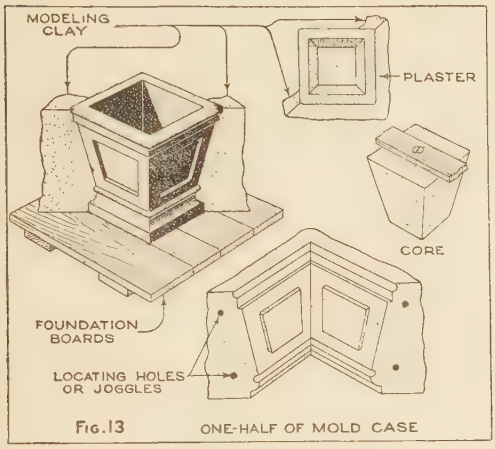
The materials needed are: fine casting plaster, moist modeling clay, stearin, a good heavy-bodied oil, such as lard oil, some loosely woven burlap, and orange-shellac varnish.

Shellac the vase, inside and out, two or three coats, permitting each coat to harden before applying the next, then set the vase on the foundation board. Build up, on diagonally opposite corners, with the modeling clay, as shown, making one face of each wall straight. Dissolve some stearin in kerosene, and apply a thin coat to the vase faces; coat the clay walls and foundation boards with the oil, then mix up the plaster. This should be mixed by first filling a wide basin with water, then taking up the plaster in double handfuls and sifting between the fingers into the water. Some judgment as to the amount mixed and the proper consistency is necessary; 11 cups of plaster to 7 cups of water is about the right proportion. Build the plaster onto the vase, as shown in the plan, and allow it to harden. When it has hardened, remove the clay and scrape two holes, about ½ in. deep and ½ in. in



Various Designs for Sundial Pedestals, Bird Baths, and Fountains are Shown in Figures 8, 10, and 12. Figure 9 Illustrates a Method of Fastening Sundials to Pedestals; Figure 11, Molding Bases by the Template Method

diameter, on each end face of the half mold. These are known as "joggles," or "joggle holes," and when the other half



The Making of a Simple Plaster Mold for a Rectangular Vase; This Is a Good Exercise for the Amateur Concrete Worker

of the mold is cast, small projections fit into the holes, thus locating the halves accurately.

Shellac and oil the exposed edges of the half case, and then plaster on over the remaining sides of the vase, to form the other half of the mold. Coat the inside of the vase with stearin and fill with plaster, then lay a strip of wood, with a woodscrew in the center, across the center of the vase, sinking the screw down into the soft plaster. This will form the core of the mold. The core may, if desired, be made of wood, well shellacked. When choosing designs to copy, it is well to pick one having the interior well tapered, so that the core may be made in one piece. If the plaster mold is to be used for many pieces, it should be reinforced with burlap. This is cut into two lengths, each a little shorter than the length of two sides of the vase, and somewhat narrower than its height.

When the plaster is applied to the vase, to about half the thickness of the case, one of the lengths of burlap is dipped into the plaster and applied to the case; the remaining portion of the plaster is then applied over the burlap to the proper thickness. This strengthens the case considerably.

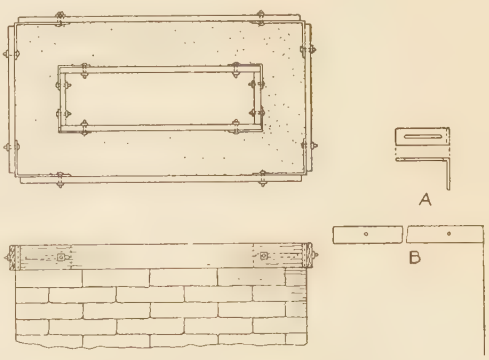
When the core and casing have hardened, give them two coats of shellac, then a light coat of stearin, and assemble them on the foundation boards. The two halves of the mold may be held by dipping strips of burlap in a thin plaster mixture and pasting them over the corners of the case. These, when hard, will hold the case firmly. Suspend the core in the center of the case, by means of the wood strip, and pour in the concrete. When this has hardened, remove the burlap strips, pull out the core, and withdraw the case carefully. Cover the vase with wet cloths for two days, then place it in a tub, and keep it covered with water for several days.

Further instructions in making plaster molds will be given in the next installment.

Mold for Forming a Chimney Top

The outside corners A of the mold are made of sheet steel, about 18 in. long and 3 in. wide, bent in the center at right angles. The ends of these pieces are slotted to fit ⅜ or ½ by 1½-in. on bolts. The inside corners are made in the same manner, except that they are 10 in. long. The sides B are made of wood, 3 in. wide and ¾ in. thick, with a hole in each end for a bolt. The length of the outer sidepieces is about 18 in., the length of the endpieces, 12 in.; the inner sidepieces are about 9 in. and the ends 6 in. long.

The parts are assembled as shown, the slots in the ends of the metal corner pieces allowing considerable adjustment for making different-sized chimneys. A



An Adjustable Take-Down Mold for Forming Cement Tops on Chimneys. The Mold will Fit Many Sizes of Chimneys

thin strip is slipped in between the mold and the top of the chimney to hold the former in place while the cement is poured in and until it sets. The mold is taken apart by removing the nuts from the bolts.—W. E. Crane, Cleveland, O.

¶Cement posts may be used when thirty days old, but not sooner. Concrete gains strength during the first year.

BY JAMES TATE

Part III—Plaster Molds

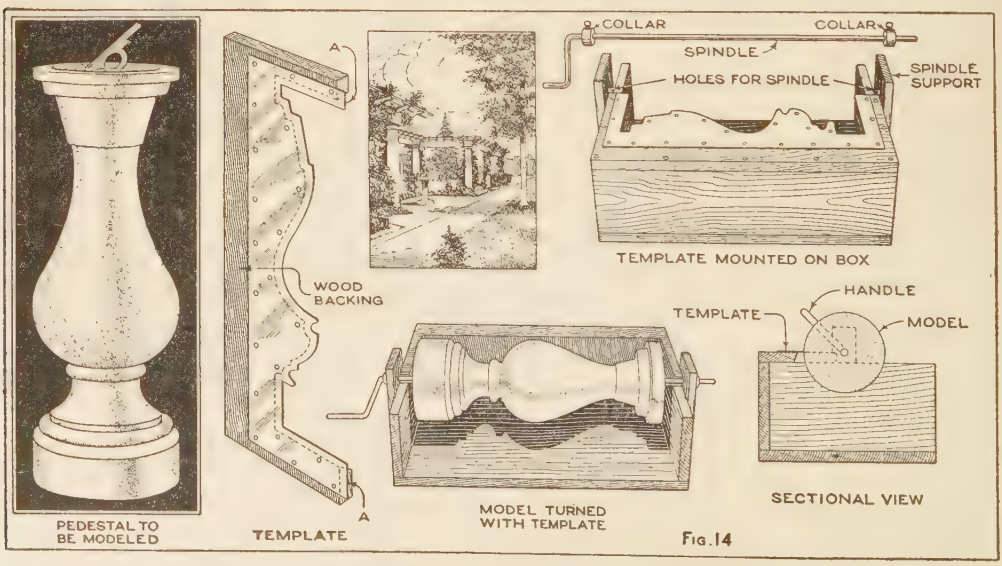
THE method of making models in plaster, of pedestals, balusters, and other objects of circular cross section, and of making a mold from the model, is very similar to the process of making plaster lamp bases, described on page 631 of the April, 1921, issue of Popular Mechanics.

It is better for the amateur, especially if he is doubtful of his ability to produce a neat and harmonious design, to procure a wooden baluster or column, shellac it well, and use it as a model on which to build his mold. Balusters or columns may be purchased, at a very small cost, from any dealer in millwork, and will save much work and time. Those who wish to work out their own designs, however, will be able to do so by following the instructions given in this article.

The first thing to do is, of course, to select the design. This should be as simple as possible, with no undercut portions that would cause trouble in withdrawing the model from either the template or the mold.

Obtain a piece of galvanized sheet iron, about 6 in. wider than the largest radius of the design, and about 3 in. longer than its height. True up one edge, and, using this edge as a center line, lay out one-half of the design upon the sheet. With cold chisel and snips, cut out to the approximate shape of the design, finishing with fine half-round files.

This sheet-iron template is then mounted on a backing of 1-in. lumber, as shown in Fig. 14, in such a manner that the edge of the sheet iron will project from $\frac{1}{8}$ to $\frac{1}{4}$ in. from the wood, which should follow the outline of the design closely. This backs up the template. The latter, with its wooden backing, is then nailed to a stout box, as shown in the upper right-hand corner of Fig. 14, the



While It Is Easy to Obtain Wooden Balusters and Columns from Which Molds may be Made, This Illustration Shows the Method of Originating Models in Plaster by Means of a Template

box being of sufficient depth to clear the largest portion of the design. A spindle, which may be either of light iron rod or pipe, is then made as shown and provided with collars, which bear against the spindle supports, or bearings, and prevent end motion.

The spindle supports are screwed in position, and holes to fit the spindle bored in them; the centers of these holes must be exactly in line with the edge of the sheet-iron template, and the spindle, when inserted, should bear against the template. When laying out the template, provision should be made for the diameter of the spindle; that is, as the center of the spindle will be the center of the finished model, the edges marked A on the template must be cut back for a distance equal to half the diameter of the spindle.

Set the spindle in place, adjusting the collars, so that, while allowing it to turn freely, there is no end motion; cut a piece of burlap, a couple of inches shorter than the design and about a foot in width, dip this in a thin plaster mixture, and wrap around the spindle, tying it with pieces of cord if necessary. This affords a good foundation for the plaster, and also reinforces it.

Mix fine casting plaster in water to a thick creamy consistency, and commence pouring over the burlap-wrapped spindle, at the same time turning the latter by means of the crank. As the plaster builds up, it will be shaved off by the template. When the model approaches completion, thin the plaster just a little.

When the model is completed, remove it by unscrewing the spindle supports, and set it aside to harden for about 24 hours.

At the end of this period, saw the spindle off close to the ends of the model, shellac the latter, two or three coats, allowing each coat to dry before applying the next, and it is ready to be used in making the mold.

The proper method of dividing a circular mold is shown in Fig. 15. If the mold is made in two pieces, one piece is quite likely to be a little larger than the other; that is, the division would not be exactly on the center line of the mold, so that one piece would embrace somewhat more than a half circle, making it impossible to withdraw the model without breaking the edges of the mold. By making the mold in three parts, the risk of such damage is eliminated.

Lay the model, or the wooden baluster, if this is employed, on its side. Build up, as shown in Fig. 16, two walls, or dams, of modeling clay, about 2 in. square and about 120° apart. When these have set a little, coat both dams and the surface of the model between them with lard oil, then fill in between the dams with plaster to the same height as the clay, smoothing it off roughly on the outside. If desired, when the plaster has been poured on to about half the desired thickness, pieces of burlap may be used to reinforce it, as described for the making of the square-vase mold in the June installment.

Allow the plaster to harden thoroughly, then strip off the clay, build up another clay dam, 120° farther around, scrape out the "joggles," and shellac the exposed edge of the part of the case already cast. When dry, oil the dam, model, and edge of the first section, and pour on plaster to make the second section. When this, in its turn, has hardened, strip off the clay, cut the joggles, shellac and oil the exposed edges, and pour the third section. The plaster of each section may be carried over the end of the model if desired, as shown in Fig. 18, to form a bottom for the mold, although, if the mold is to be used on a good level foundation board, this is not absolutely necessary. When thoroughly hard, the mold is well shellacked on all surfaces, and is then ready to be assembled and filled with the mixture of one part cement, two parts sand, and three parts clean broken stone or gravel, which must not be larger than will pass through a ¼-in. screen.

Another method of making molds, particularly applicable to designs with square caps or bases, or both, is shown in Figs. 19 to 22. A square base, of the same size as the bottom of the model, is first made, as shown in Fig. 19. Joggle holes, and a hole in the center for an iron reinforcing rod, are cut in this; when hard, it is then set up against the bottom of the model, which is laid on its side, and clay dams are built along the length of the model and base, the dams being shaped and placed as shown in Fig. 20. When the plaster for the first section has been poured and has hardened, the model is turned over, and the opposite side is treated in the same manner. Joggle holes are cut in the four exposed edges of the mold sections, the edges are shellacked and oiled, and the remaining sides poured. The form of two of the completed mold sections, the base, and reinforcing rod, are shown in Fig. 21, and the mold set up and in course of being filled in Fig. 22. When fastening the mold sections with wire, use L-shaped pieces of tin at the corners, to prevent the wire from cutting the mold.

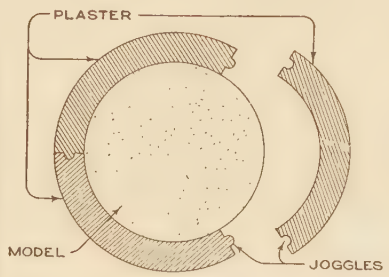
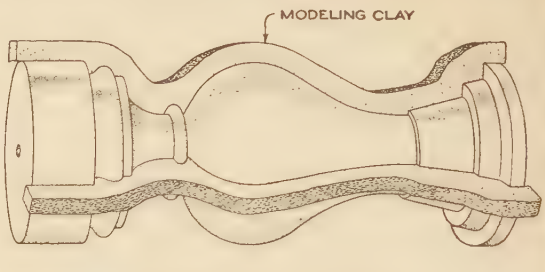


Fig. 15 CORRECT METHOD OF DIVIDING CIRCULAR MOLD



BALUSTER LYING ON SIDE READY FOR APPLICATION OF PLASTER

Fig. 16

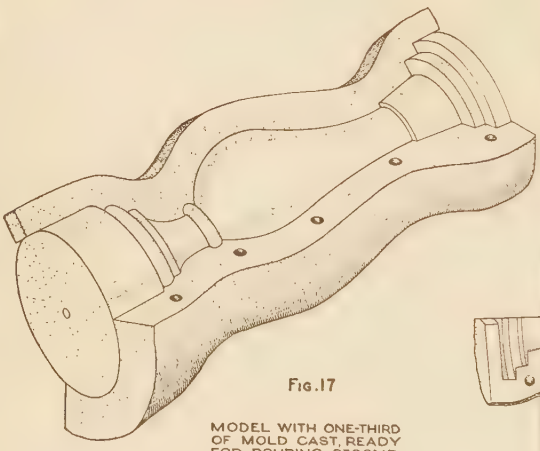


Fig. 17

MODEL WITH ONE-THIRD OF MOLD CAST, READY FOR POURING SECOND SECTION

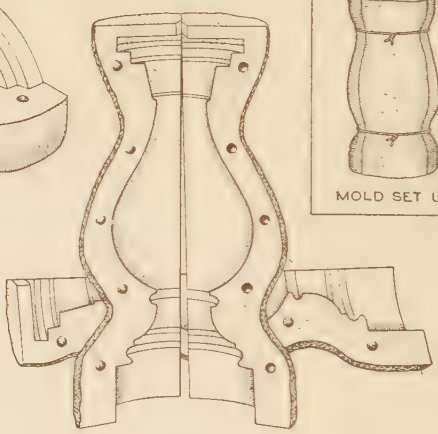
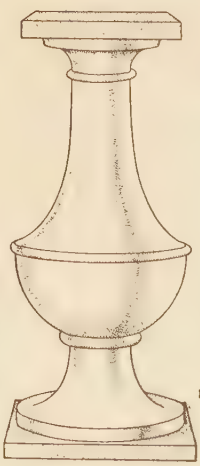


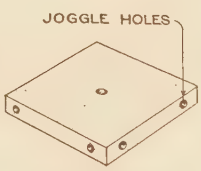
Fig. 18 MOLD COMPLETE

MOLD SET UP



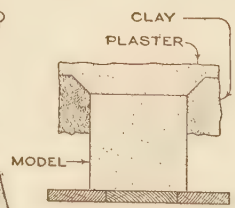
PEDESTAL OR BALUSTER WITH SQ. CAP & BASE

Fig. 20

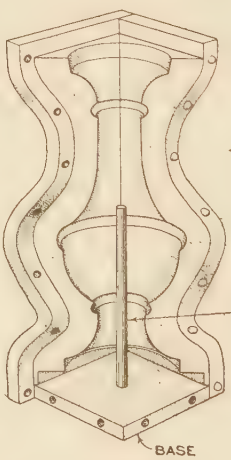


BASE OF MOLD

Fig. 19

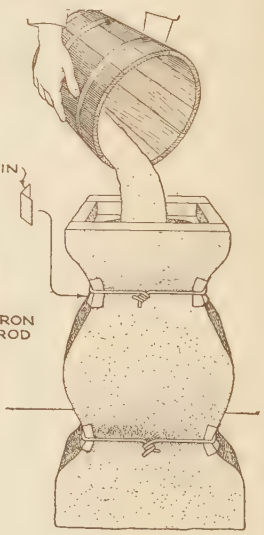


METHOD OF MAKING MOLD



TWO SECTIONS OF MOLD AND BASE SET IN POSITION FOR FILLING

Fig. 21



FILLING THE MOLD

Fig. 22

The Various Steps in Making Molds from Models of Circular Section are Shown in this Illustration. Figs. 15 to 18 Show the Construction of a Mold for Pieces Having a Circular Section Throughout; Figs. 19 to 21, Making a Mold for Pieces Having Square Sections Incorporated in the Design, As, in This Instance, the Cap and Base. A Method of Fastening the Molds When Filling with Concrete is Also Shown

BY JAMES TATE

Part IV—Glue Molds

WHEN pieces of elaborate design, containing portions more or less undercut, are to be cast in concrete, glue molds are employed.

To the worker who has followed this series thus far, the making of glue molds will present little difficulty. In this, as in the casting of balusters and pedestals, it is necessary that the worker procure a wooden model of the design to be reproduced, unless he has sufficient ability as a modeler to make his own designs in clay. For one who has not, there is a wealth of material available in old carved furniture, or in plaster ornaments, parts of which may be pressed into service; for example, the writer has often used old carved legs of tables as models for the legs of garden tables; pieces of plaster-ceiling ornament as decorations for panels on sundial and other pedestals, and ornamental plaster molding as models for molding to be used in connection with similar garden pieces; many other carved-furniture parts and ornaments may be used with equal facility. The last illustration in this installment shows a garden table made by using models of this character, and the making of the legs is illustrated in the other drawings.

The first step is to shellac and oil the model. Lay it down on the working board, as shown in Fig. 23, and draw a line along each side, in the most convenient position for parting.

Obtain two pieces of thin board, about 6 in. wide, and cut one edge of each piece to fit the model as closely as possible, at the parting line. Nail blocks on these boards, as in Fig. 24, to support them so that their upper face will be exactly at the parting line.

Take a sheet of old newspaper, wet it, and spread it over the upper half of the model, pressing it down into close contact. Then take some modeling clay, flatten it out into a sheet, about ½ in. thick, and apply it over the newspaper, pressing the clay down into every detail on the model surface, and carrying it down until it rests upon the boards at each side of the model. Oil the surface of the clay, then build up upon it a plaster case about 1 in. thick. Fig. 24 shows the clay and plaster coating, in section, upon the model. When the case has hardened, turn the model, with its clay and plaster covering, on its opposite side and remove the boards. This leaves one half of the model exposed, as in Fig. 25, with a straight, clean surface of clay and plaster at the parting line. Spread wet newspaper over the exposed half, apply

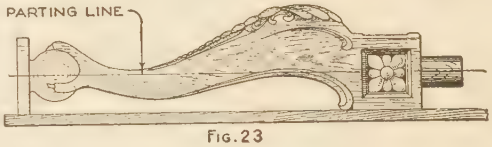


FIG. 23

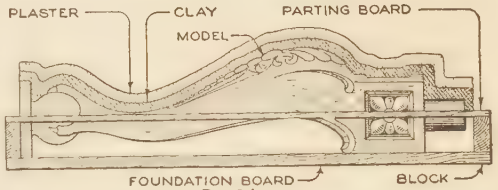


FIG 24

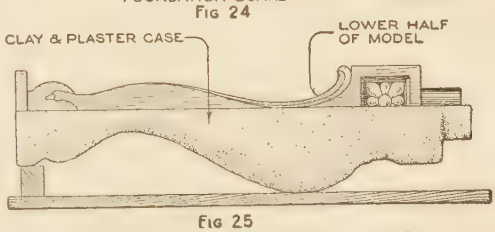
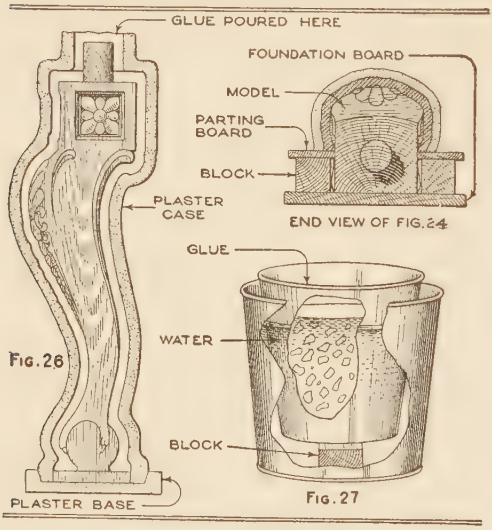


FIG 25

Figs. 23-25—Method of Applying Clay and Plaster to the Model, and of Using Boards to Support the Case

the clay coat, oil, cut joggles in the edge of the plaster case, oil this edge, and pour the remainder of the case. Allow the whole assembly to harden thoroughly, then cast a plaster base on the case, as

shown in Fig. 26, tapering the bottom edges of the case before pouring the base. When hard, remove the base, separate the halves of the case, and carefully clean away the clay and the newspaper, both from the model and the case, shellac and oil all surfaces of the plaster case and base, oil the model, and reassemble. We have now the model inside the plaster case, with a space between, as may be seen by reference to Fig. 26, of the same



Mold in Position, Ready for Filling with Glue: Figure 27 Shows How the Glue should be Melted for Large Pieces

thickness as the clay had been. This space is to be filled with glue.

The glue used for molds is a good grade of white glue, obtainable at any dealer in painters' or plasterers' supplies. It must be melted in a regular gluepot, if the piece is small, or, if much glue is required, use two pails, one inside the other, as shown in Fig. 27. Support the inner one upon a block, a few inches high, fill the outer one about one-third full of water, put the glue, which has previously been soaked in water for about 15 minutes, into the inner one, with about a quart of water, then heat gently. When the glue is of the proper consistency, pour it into the space between case and model. The glue will require about 24 hours to harden. When hard, remove the plaster case, and cut the glue carefully along the slight ridge that marks the parting line of the case. This makes a glue mold in two parts. Paint the inside of the glue mold with the very best grade of clear varnish, three or four coats.

When ready to make a cast, place each section of the glue mold back into its own half of the case; this is necessary because the glue is so flexible that it will not support either its own weight or the weight of the concrete. Oil the interior, assemble the case and base, strap the case firmly, and the mold is ready for filling with the mixture of 1 part Portland cement to 2 or 3 parts sand. Do not hesitate, when stripping the glue from either model or finished piece, to pull firmly, though carefully, on the glue mold over undercut portions; it will come away easily if proper care is taken, and will snap back into place when released. Glue molds cannot be used for more than four or five casts, but as the old mold, cut up into small pieces and allowed to dry, may be used again, there is little or no waste. The writer has seen molds made of glue that had been used for several hundred casts, and that, when used with a proportion of new glue, retained all its first flexibility, reproducing the most delicate designs with great fidelity.

The making and using of glue molds is a very interesting process, and is one that will repay the effort spent upon it. The worker should keep his eyes "peeled" for suitable subjects and models; many models may be picked up during the dismantling of old buildings; the passing of the saloon especially has made available many pieces of woodwork eminently suitable for this purpose. When reasonable care is used, pieces that will be a delight to the eye may be made from glue molds, and if simple designs are used, they will harmonize with almost any surroundings. Simple designs should, in any case, be chosen by the beginner, as, with elaborate

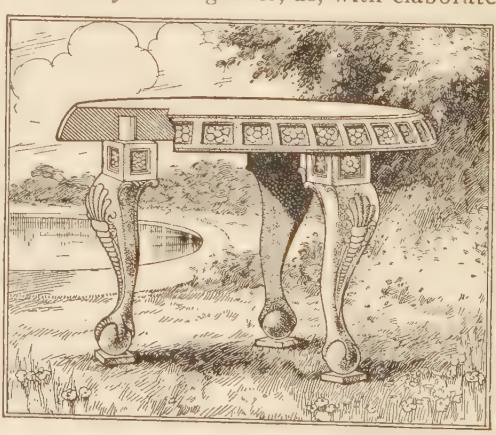


Table Cast in Concrete: The Legs were Cast in a Glue Mold Made by Using a Carved Table Leg as a Model

ones, the first results are apt to be somewhat disappointing.

BY JAMES TATE

Part V—Ornamental Pools

THE appearance of even the simplest garden may be considerably enhanced by the addition of an ornamental pool, of a size suitable to the surroundings. The construction of the garden pool is simple, and, with or without the presence of aquatic plants, a note of dignity and attractiveness is added to the garden by the cool, quiet water.

The selection of the site, while governed, of course, by the space available, and by consideration of the other details of the garden, is important, and should be given careful thought. The ground must be firm and well drained, to afford a good foundation for the walls and floor. The weight of the water and concrete in a pool of fair size is considerable, and if the ground does not afford a solid support, there is some danger of settlement, with resulting cracking of the concrete. The quality and method of placing the concrete, the reinforcing, the forms used, and the method of surface finish are all important considerations, if the resulting walls are to be smooth, dense, and watertight.

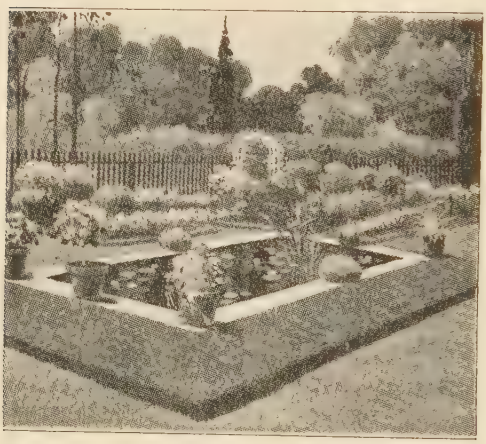
Various Pieces of Concrete Garden Furniture Combined to Make a Most Attractive Ensemble: Note the Simple Semicircular Flower Bed

The foundations, as shown in the detailed illustration, should be carried down below the frost line, the drain pipe being led out underneath the footing. The forms should be made, for the rectangular pool, of 1-in. lumber, and, to insure a smooth, dense face on the wall, should be planed on both edges and face, carefully matched, and water-tight, as a small leak in the surface of the forms will allow the cement to run through, thus leaving an air pocket in the surface of the wall.

Particular attention should be paid to the bracing of the forms; the best method is shown in the illustration. In addition to woven-wire reinforcing, shown by the dotted line in the cross-sectional view, ⅜-in. rods are used in the side walls; three on each side and end will be enough, spaced about 6 in. apart.

The concrete used is what is known as a 1.2:4 mix, that is, a mixture of 1 part Portland cement, 2 parts clean sharp sand, and 4 parts of clean broken stone. An estimate of the amount of material needed for a rectangular pool of the dimensions shown is: cement, 9⅓ bbl.; sand, 2.8 cu. yd.; broken stone, 5.61 cu. yd.; woven wire, 65 sq. yd., and ⅜-in. rod, 140 ft. When the outside forms are in place, and the foundation laid, adjust the woven-wire reinforcing as shown by the dotted

line, place the inside forms in position, then fill in the concrete, which must be of a "mushy" consistency, spading it well next to the forms, and laying in the ⅜-in. rods in the proper positions. By spading is meant the thrusting of a thin paddle



A Pleasing Concrete Lily Pool of Suitable Size for the Small Garden

between the newly placed concrete and the form, to obtain a wall surface free from pits and voids. A hoe, straightened out in line with the handle, makes a good tool for this purpose, or a thin wooden paddle may be used. The inner forms may be removed in about 24 hours, and the face of the walls painted with a cement and water mixture, to make the surface more dense.

It should be noted that the inner form must be set to slope, as shown. This is necessary because, when winter sets in, and ice forms in the pool, the ice will slip up the sides, instead of exerting its thrust straight against the face of the walls, as it would if the faces were vertical.

The following materials will be necessary for the construction of a circular pool of the dimensions given: cement, 9½ bbl.; sand, 3 cu. yd.; broken stone, 5.62 cu. yd.; woven wire, 75 sq. yd., and ⅜-in. rod, 110 ft. This pool may be constructed by using silo forms, if these are available; if they are not, sheet-metal forms will be found just as good. The method of reinforcing, placing the concrete, etc., is similar to that used in making the rectangular pool, but the inner face, to save trouble in making the form, should be left vertical, removing the inner form as soon as possible and forming the interior slope with cement.

The walls and bottoms of the pools should be wetted at least twice a day for about two weeks, to assist in curing the concrete, and the pools should not be put into service until the end of this period.

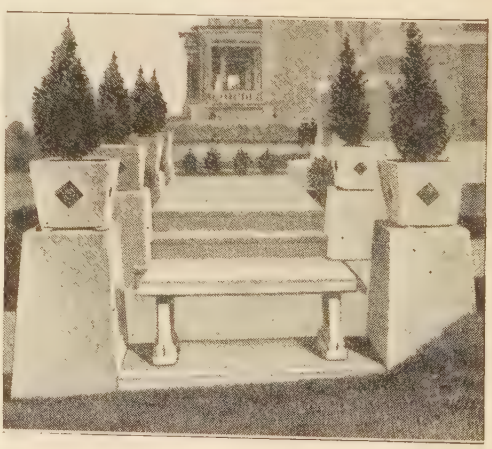
The best method of keeping the concrete wet is to cover all the exposed surfaces with canvas, wetted frequently. Another method of preventing the floor from drying too rapidly is to cover it with a layer of earth, 7 in. deep, sprinkling this thoroughly, together with the walls, several times a day.

At the end of the curing period, the floor should be covered with about 1 in. of water, this depth being gradually increased, until, at the end of about 20 days, the pool is filled with water.

It may not be amiss to give here a list of aquatic plants best suited for small pools. Among the *nymphæas,* or water lilies, the following varieties give best results: *N. Graziella, N. Aurora, N. fulva, N. pygnæa, N. pygnæa,* var. *helvola.* Parrot's feather, water snowflake, water poppy, and pickerel weed are also suitable, while papyrus forms a very attractive centerpiece around which to group smaller plants.

Many of the foregoing instructions apply with equal force to the construction of swimming pools, although somewhat greater care must be used in the selection of a suitable site, and in the reinforcing of the walls and floor.

As it is not possible to lay the floor of a large pool in a single day, joints must be provided at the end of a day's work. A ½-in. strip of wood, afterward removed, will form this joint. The open joint is



Simple Pedestals, Benches, and Flower Boxes Add Considerably to the Appearance of the Formal Garden

afterward filled with a bituminous sealing compound. A similar joint must be pro-

vided at the junction of wall and floor, and V-joints to provide a proper bond between previously laid material and the new concrete must be left in the walls.

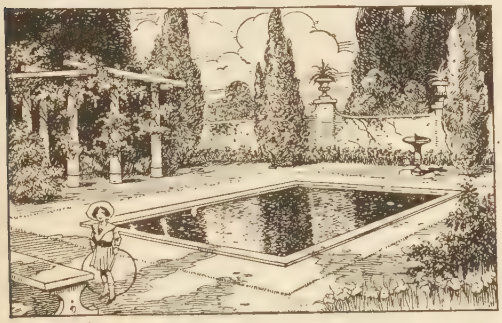
The fittings for a swimming pool will, of course, depend upon personal preference. A springboard is almost a necessity, and steps or climb-out ladders, the latter preferably of U-shaped iron rods, with the ends imbedded in the walls, should be provided for convenience of the bathers.

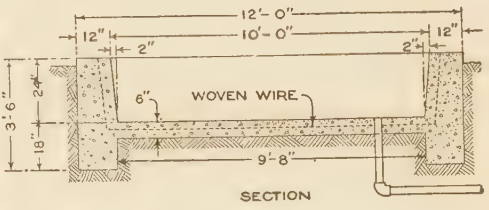
A concrete walk, rough-finished to prevent slipping, should run around the pool; this should not be laid until the backfill around the walls has settled for a period of several months; this will prevent the concrete walk from cracking.

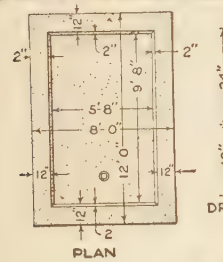
Wading pools are a godsend to the youngsters in hot weather, and will more than repay the effort of construction. They may be built with gradually sloping sides, dispensing with the wall and footing, and rough-finished with a wood float, to eliminate the danger of slipping. In these, as in all other pools, the underlying earth must be compact and firm, to support the concrete and prevent cracking.

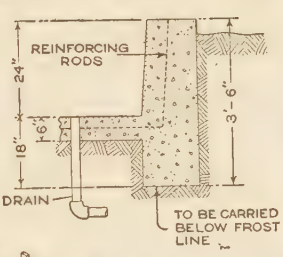
The various types of garden furniture described in this series by no means exhaust the subject. The illustrations show what may be accomplished by grouping several pieces such as vases, pedestals, benches, etc. Small semicircular flower beds, set against, or made a part of, the wall, relieve the monotony of a long wall, and are very easily made; to the ingenious reader, many other combinations will suggest themselves.

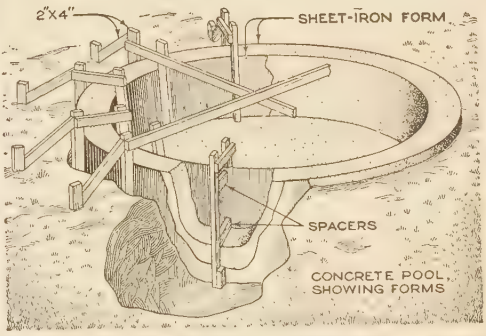
In conclusion, I may say that the worker will find the making of garden furniture in concrete a very interesting pursuit, and the articles produced are a permanent addition to the attractiveness of the home site.

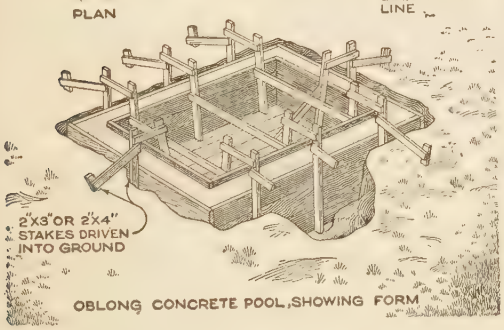


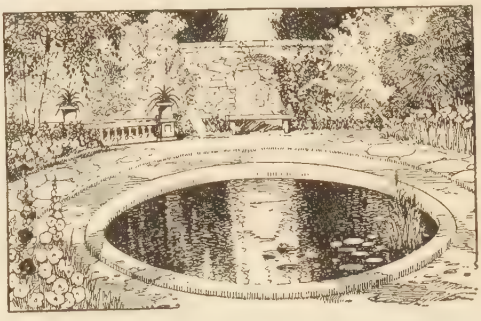












Dimensions and Full Details of Two Easily Made Garden Pools: This Work Is of the Simplest Nature, and the Results will Be Very Pleasing If Proper Care is Used in the Selection of a Site. Aquatic Plants, Such as Water Lilies, Parrot's Feather, etc., may be Used in the Pools if Desired

THE interesting bird bath described and illustrated in this article was turned from concrete, on a platform or wheel made of rough boards and rotated by hand, the concrete being built up on the wheel and the contour formed by turning the mass against a sheet-metal template, supported close to the side of the wheel. The same design would also serve for a fountain or a goldfish bowl, and the method of turning the column and base would work equally well for making a sundial or gazing-globe pedestal, or similar piece of concrete garden furniture.

Build the wheel or platform of rough 1-in. stock, in two layers, with the grain of one at right angles to that of the other. (See Fig. 1.) Nail the layers together well, scribe a circle, 28 in. in diameter, on the platform, and saw it to shape with a compass saw. Now bore a hole in the center, a driving fit for a 3-ft. length of ½-in. water pipe. Over the lower end of the pipe drive a length of 2 by 6-in. pine, which is to be tacked to the underside of the platform. Light hammer blows on this block will bring the pipe at right angles to the wheel, when the block can be nailed solidly in place, with the pipe projecting through the upper surface of the platform. The pipe should also project about 3 in. below the block.

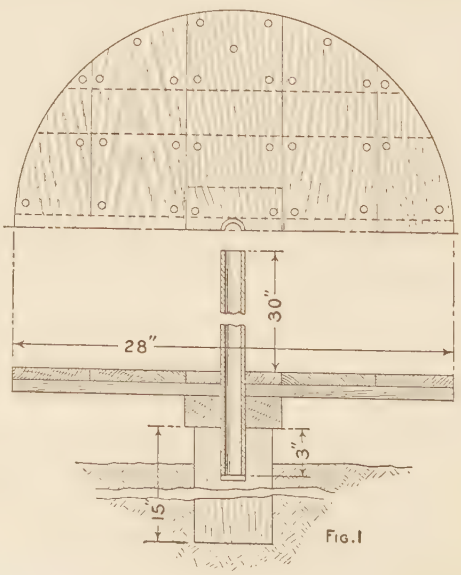


Fig. 1

Set in the ground a piece of 4 by 4-in. pine, with the end projecting 3 in. above the surface, and, centering on the end of the piece, bore a hole, ⅛ in. larger in diameter than the pipe, to serve as a socket for the projecting wheel pivot. Set the wheel in place on the 4 by 4-in. bearing, then drive a 1 by 3-in. stake into the ground close to its edge. The stake should be about 3½ ft. long and must be supported firmly. It can be braced to any convenient object near at hand, or, if this is not possible, to stakes driven into the ground behind it.

The upper end of the pipe is then secured so that the platform will be level in every direction, by means of two braces

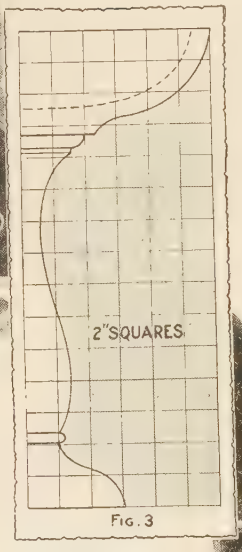


Fig. 3

bored to fit over it, and fastened to posts or stakes at the outer ends, or to the top of the long stake already in place. Rotate the platform. If the pipe does not turn with it, owing to loose fits in the wheel and block, make the necessary alterations so that the pipe will turn with the platform, for a stationary center will cause no end of trouble later, when the concrete is being shaped. At intervals of 60° around the circumference of the wheel drive short stakes as shown in Fig. 2, and nail guide cleats to them, projecting over the surface of the platform, to insure that the wheel will have a horizontal motion.

Make a paper pattern of the bird-bath profile given in Fig. 3. This is done by ruling the paper into 2-in. squares, locating a number of points on the profile in Fig. 3 with the dividers, and then marking similar points on the ruled paper, afterward drawing the profile through the points marked. Trace this on a sheet of tin or sheet iron, either with carbon paper or by cutting the paper pattern out first and then tracing along the edge. The template for the bottom may be cut separately, if desired. Cut the sheet-metal template out with tin snips and smooth with a file. Stiffen the iron with strips of wood nailed to both sides, as indicated in Fig. 2, then nail the template to the tall cleat at the side of the wheel at the proper distance from the center, allowing ¼ in. between the bottom of the template and the top of the wheel for clearance. The wheel is then ready for use.

Get some sand of the quality used for good concrete work and screen it through ⅛-in. mesh. A wheelbarrow makes a very convenient receptacle for the sand when screening, a hoe handle or similar tool being used under the screen as a roller, as in Fig. 4. On top of the platform, build a pile of moist sand and shape it to the contour

Fig. 2, Setting Up Template on Wheel; Fig. 4, Screening Sand for Concrete and Bowl Mold

of the inside of the bowl, as shown in Fig. 5 and the dotted lines in Fig. 3. Pat over the sand core a small quantity of cement, and allow this to harden.

For turning the bowl, a fair quantity of concrete, mixed in the proportions of two parts of sand to one of cement, may be stirred wet in the wheelbarrow, as indicated in Fig. 6, but for the column only a small quantity at a time should be wetted. The addition of a small quantity of slaked lime to the concrete makes it more plastic and easier to work. Now cover the sand with concrete, mixed wet enough to be handled easily but not sloppy, turning the platform slowly while doing so. The concrete, of course, settles outward, and consequently it must constantly be pressed upward with the hands until it has stiffened enough to hold together. A trowel, thrust between the tem-

plate and the bowl, helps in this operation. If trouble is encountered, due to the material breaking away from the mold during this process, keep the main body of the material back from the template about ¼ in., then, when this has set, plaster with thin concrete and turn against the metal. The hands, rubbed over the surface as in Fig. 7, will smooth the work very well.

The photo, Fig. 7, shows a part of the column being turned with the base, but the writer found it advisable to cut the column away, down to the molding under the bowl. The bowl, allowed to harden, was then removed from the platform and pipe, and the base and the whole column were turned together.

In order to do this, the template, of course, was removed from the stake and reset upside down, taking care to get it in the same relative position as before.

For the column, use a mixture of one part sand to one part cement, a so-called "rich" mixture. If, as the column is built up, nails are stuck freely into its surface, much of the falling away of the material will be avoided. A small trowel, held between the surface of the work and the template, will be found useful in smoothing the concrete. When the column is finished, stand it, upside down, on the bottom of the bowl and model out the swell at the top of the column to meet the molding. As the work is upside down, this, of course, means that the swell is at the bottom of the column while the modeling is being done. A scraper made from thin wood is useful in doing this work.

Fig. 5, Shaping Bowl Mold; Fig. 6, Mixing Concrete; Fig. 7, Smoothing Bowl Surface

When the concrete has thoroughly hardened, the bird bath is ready to be set up. Smooth off the inside of the bowl and build up a more or less symmetrical mass of concrete around the projecting pipe, to hide it; this forms a small "island" in the center of the bowl. Lastly, round off the rough edge of the bowl with a rasp. The finished bath is shown in the headpiece of the article.

White Paint for Concrete

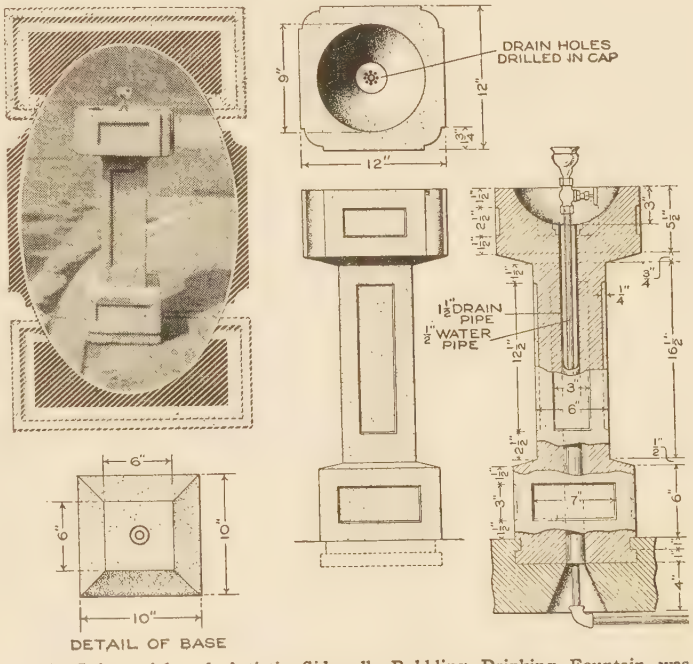
A durable white paint for concrete steps, walls and walks can be made from lime and cement. Take hydrated lime, two parts, and cement, one part; mix these together thoroughly and scald with boiling water.

If a very white finish is desired, use white cement. It is applied with a large paintbrush and forms a coating that will not rub off.

A Sanitary Drinking Fountain of Concrete

By GEORGE E. TONNEY

BUBBLING drinking fountains are being installed on the sidewalks by many cities throughout the country, but because of the expense fewer than needed are often provided. By making forms for a substantial, artistic fountain of standard design in concrete, like that shown in the illustration, these public conveniences can be built at small cost. The mold, as detailed, is adaptable to a large variety of designs. It is built up of wood, joined together at the four corners in a miter joint, and the sections are held together, while the form is in use, by a top and a bottom plate, and wires twisted around the shaft portion of the mold. The concrete is poured in through an opening in the upper frame, or plate. For quantity production, several duplicate forms may be made. The water-feed pipe is incased in a 1½-in. drain pipe, cast into the mold when the concrete is poured in, and set as shown in the drawing.



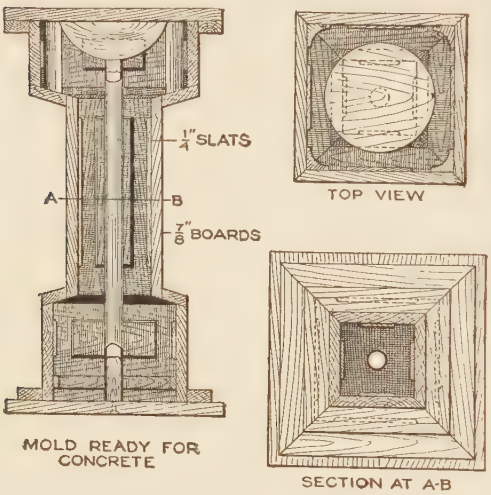
This Substantial and Artistic Sidewalk Bubbling Drinking Fountain was Made in a Simple Wooden Form, Which can be Adapted to a Large Variety of Designs

The construction of the fountain, detailed briefly, is as follows: Lay out a full-size sketch of the fountain, as shown in the sectional view of the working drawings. This can be done handily on a wide board, or on a long strip of wrapping paper. Indicate both the front and top views, and then lay out the parts of the wooden form, as detailed in the top view and the vertical section of the mold ready for the concrete. The wood used is ⅞ in. thick. Care must be taken in laying out this drawing carefully, especially as to the joining of the pieces, which are arranged to be nailed handily. In shaping the pieces make all the light strips at the same time, cutting a board long enough for all the shorter sections of each variety. Fit the pieces to the full-size drawing, and cut them, for the corner joints, in a miter box. Smooth the inner surfaces of the pieces carefully before nailing them together.

When the outer ⅞-in. boards are shaped and fitted for the four sides, nail them together, driving the nails part way in, and fit the sides together. Then make the top and bottom frames to hold the sides in place. If the joints fit snugly, drive the nails in and set their heads slightly below the surface.

Before putting the panel blocks into place, smooth off the inner surface of the mold and sandpaper away all the sharp corners. Then make the panels, which are ¼ in. thick. Nail them into place, centering them carefully on the sides of the sections. The panels should be beveled slightly, so as to withdraw readily from the concrete. Fill all of the nail holes smoothly with plaster of Paris. Make a wooden block for the basin at the top of the fountain, and arrange it to be set on top of the pipe, which is adjusted carefully in the center of the mold and held in place by nails driven into blocks set in the ends. A tin pan may also be used to form the basin. Apply two coats of shellac, sanding them lightly when dry, on all surfaces of the mold which come into contact with the concrete. If the mold is to be used repeatedly, it will pay to use extra-good wood, preferably pine, and to soak the wood in oil.

If the form is properly made, little or no difficulty will be experienced in setting it up and pouring the concrete. Apply a uniform coat of linseed oil to the inside of the form. Bind the center portion of the form tightly with heavy wire, and set the top and bottom frames securely into place, tacking them with light



Left: Completed Mold, Ready for Use. Right: Top View and Cross Section

wire nails. Mix a 1:3 mixture—one part Portland cement to three parts coarse clean sand—making it quite wet. Pour in the mixture, and jar the mold slightly to insure that the concrete runs into all the corners. Permit the fountain to dry at least 48 hours, in a cool, dry place. Remove the form carefully, tapping it slightly to prevent any of the corners from breaking. Repair any breakage or holes by filling the spots with the mixture. Wet the fountain for several days, while it is permitted to cure thoroughly. If desired, the surfaces may be tooled smooth by applying a paste of cement. Provision is made in the mold for locking the fountain securely into the concrete sidewalk, as shown in the sectional view. The fountain is set in a recess in the sidewalk, 2 in. deep, and concrete surfaced around it to the lower edge of the paneled base.

¶Concrete must be dense if it is to turn water. As the different batches are placed, thrust a spade or paddle down frequently into the mass, particularly next to the forms. This works the larger stone away from the face of the concrete, giving a better surface and giving the smaller particles a chance to fill pockets.

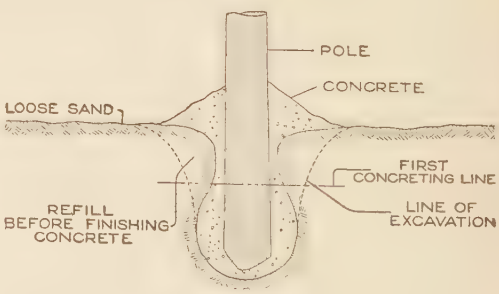
Cement Ice Houses

An ice house should be located in a place convenient to the dairy barn, and on dry, well-drained ground. Building below the ground makes drainage difficult, and removal of ice to the ground level equally difficult. It is generally more costly also, as an underground ice house requires the same material and expense in building as one above the ground, in addition to the cost of greater excavation. The soil is also a good conductor of heat. During a large part of the year, ice will melt less in a surface storage room exposed to actual contact with air than in underground storage.

One of the best forms in which to use cement for ice-house construction is hollow block. These should be of a type that will permit a wall being built with a practically continuous air space throughout, for the insulation thus afforded. The floor should be, in a measure, insulated from contact with the soil, by being laid on a well-compacted 8 to 10-in. layer of clean pebbles or cinders, free from ashes. If block is used in the construction, of course the type must be such as to permit suitable reinforcing.

Substantial and Economical Base for Poles

In setting telephone poles and poles for similar service, in loose sand or gravel, the method shown was used with ex-



This Type of Base for Poles Is Strong, and Economical of Concrete

cellent results. The cup-shaped hollow below the heavy line was first concreted around the pole and then the refill, noted above, was put in place, and the concreting finished. The refill is advantageous because of the narrow girth it gives to the concrete around the bottom of the pole, thus being harder to pull out of the ground, and also because of the saving in cement.—Roy H. Poston, Flat River, Mo.

FAULTS IN CONCRETE-SIDEWALK CONSTRUCTION

By A. J. R. CURTIS

ONE of the greatest factors in the tremendously increased use of Portland cement in the last 40 years has been the concrete sidewalk. Although the concrete walk took the country by storm about the time Dewey fought the battle of Manila, and has maintained first place ever since in popular favor, a number of ordinary errors in construction still persist. Some of these mistakes are serious in their consequences, as shown in Fig. 2, endangering life and limb, and causing much needless expense. All, however, are easy to avoid, as the principles involved in laying sidewalks are simple, and the technique easy to acquire.

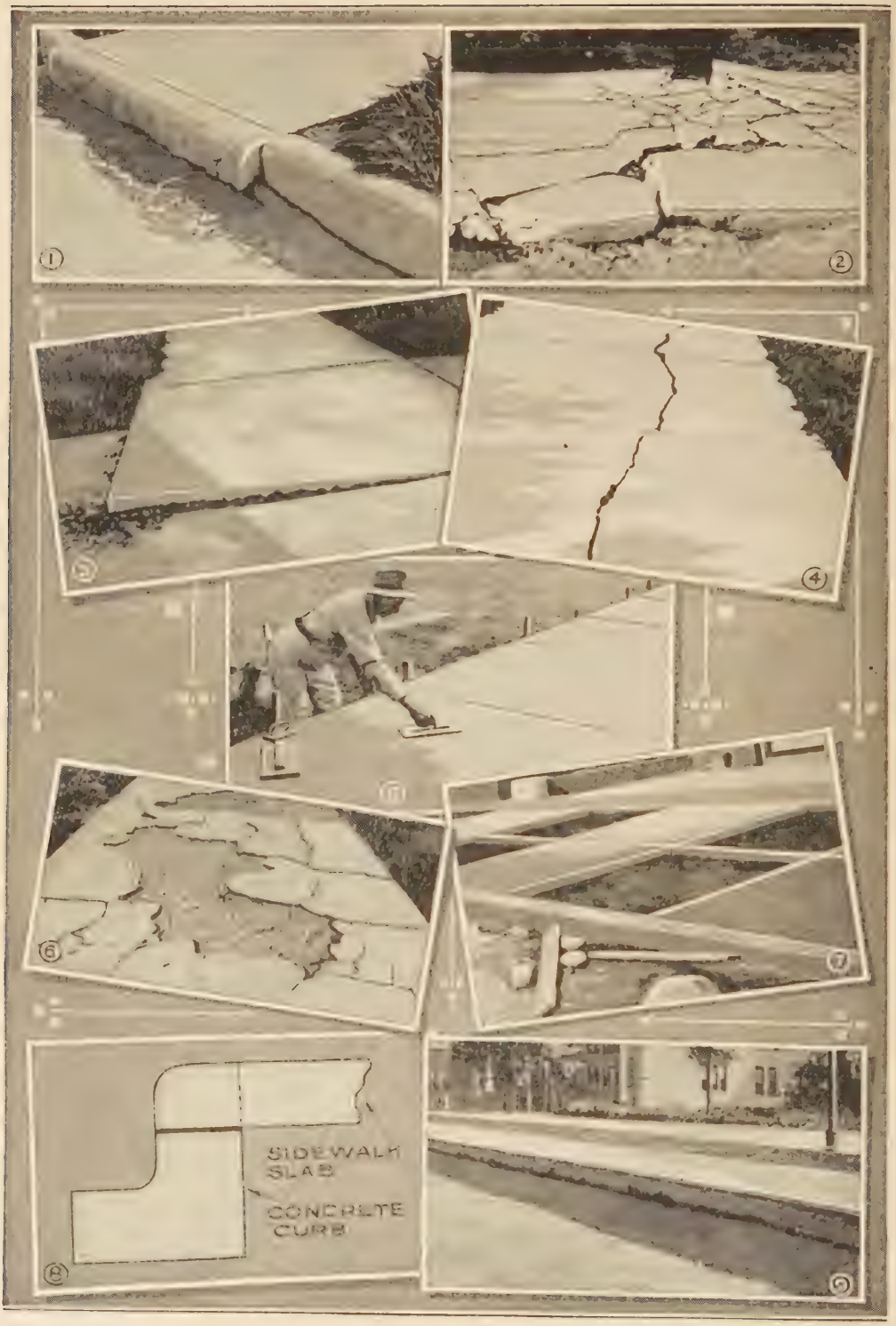
A concrete sidewalk should be merely a collection of independent concrete slabs, laid one beside another on a firm, well-drained subgrade. In locations where surface water disappears quickly and cannot become trapped under slabs, walks are frequently placed directly on the ground. If the slabs are laid where water is likely to become pocketed under them, either a subgrade, consisting of a 6-in. layer of cinders or gravel, or tile drainage, must be used to prevent possible heaving from frost. Where the walk is placed on an earth fill or elevation, the latter must be thoroughly compacted, and in the case of clay, or other water-bearing soil, the use of a cinder or gravel subgrade under the concrete is a wise precaution. Fills should extend at least 1 ft. beyond the walk on either side and the edges should slope off at an angle of 30°. The finished subgrade should slope toward one side at a pitch of ⅛ in. to the foot, and the finished walk is usually given a corresponding pitch.

Some of the common mistakes in sidewalk construction are shown in the accompanying illustrations. Failures due to disregard, or ignorance, of the law of expansion and contraction, as illustrated in Figs. 1 and 2, and of proper concreting methods, as in Fig. 6, are the most common. Concrete has an expansion coefficient of about .00001, which means that for every degree Fahrenheit in temperature change a piece of concrete will expand or contract approximately one hundred-thousandth of its length. As a practical illustration, a sidewalk 100 ft. long has an actual variation in length of about 1.2 in. between the extreme temperatures of zero and 100° F. If this walk were put down when the temperature was at 50°, it might be expected to expand one-half of the above amount if the thermometer reached 100°, and to contract as much from its original length if the temperature reached zero. Expansion in sidewalks may be provided for in ordinary straightaway work by leaving a space of from ⅜ in. to ½ in. between slabs every 50 feet.

If a long piece of sidewalk is constructed in the summer, without dividing it into separate slabs, the contraction in cold weather will be sufficient to make the walk tear itself apart at one or more places, and the opening thus formed will continue to widen as the sections continue to shrink. The remedy for this, as well as for several other sidewalk difficulties, lies in making the walk a series of disconnected slabs, usually not more than 6 ft. in each surface dimension, no slab to have a greater length than twice the width. Such slabs can take whatever little movement may be required without affecting adjoining slabs. A very effective method of producing a positive division between the slabs is illustrated in Fig. 7, which shows how the slabs are laid alternately.

The need for efficient concreting methods has always been apparent in our sidewalks. Slipshod methods have been due largely to a failure to realize that the sidewalk really constitutes a very exacting use of concrete. The apparent simplicity of the thing invites careless methods. Sidewalk slabs are quite thin for their size, probably averaging less than 4 in. in thickness, exposing large areas to extreme conditions and often hard use without any protection whatever.

In starting to lay the walk, 2 by 4-in. forms are staked firmly to the desired level, the subgrade having been properly leveled, with its surface 4 in. below the grade of the finished walk. Concrete, made of approximately 1 part cement to 2½ parts torpedo sand, and 5 parts of gravel or crushed stone, all pieces of the



In Figs. 1 and 2 are Shown the Result of Expansion; Fig. 3, a Sidewalk Slab Forced Out of Place by Tree Roots; the Sidewalk in Fig. 4 Failed Because of a Poor Subgrade, While That in Fig. 6 was Made of Weak Concrete, with Dirty Materials, and in Fig. 9 the Subgrade has been Undermined. Fig. 5 Shows the Use of the Trowel, and Fig. 7 the Proper Method of Laying the Walk. Curbs should be Cast as Shown in Fig. 8, to Prevent Their being Pushed Outward by the Expansion of the Walk

latter above ¼ in. in size, is then deposited to a depth of at least 3¼ in. This concrete should be sufficiently wet so that water will flush the surface under light tamping, and should be no wetter. The surface is struck off exactly ¾ in. below the top of the forms by means of a notched straightedge.

The surfacing course, composed of a mortar made of 1 part cement to 2 parts sand, is placed on the base course, usually within an hour, and always before the surface of the base has dried out. The mortar is mixed wet enough to be readily workable, but not sufficient for water to flush to the surface when troweled. The surface grade is obtained by working a straightedge across the top of the forms with a zigzag motion, removing the excess material and filling the depressions.

After the straightedge has brought the surface to a practically true grade, the wooden float, shown in the lower left-hand corner of Fig. 5, and later the steel trowel, are used to produce a true, even surface of smooth texture. The float is merely a flat wooden trowel, the surface of which is 5 by 15 in., with the corners slightly rounded. The steel trowel has the property of drawing the fine particles to the top very readily, and for that reason should be used as sparingly as possible, as excessive troweling will, as a rule, produce slippery surfaces and hair-line checks.

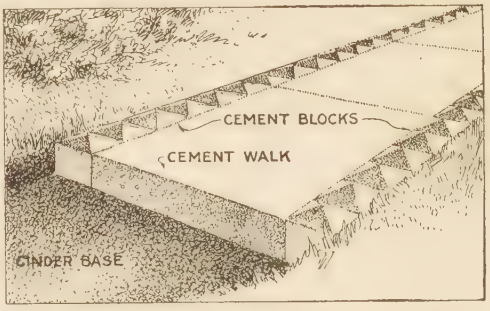
Single-course sidewalks are made throughout their entire thickness of a single mixture—usually 1 part cement to 2 parts sand and 3 parts gravel or broken stone—and are usually 4 in. thick. It is not possible to produce as smooth a surface as in two-course work, but less material is required, and quite a little less labor. In practice, the two-course construction described above requires about 1 bbl. or 4 sacks of cement for 45 sq. ft. of surface, while for the one-course construction the same quantity produces about 47 sq. ft. of surface. Metal division plates or wooden partitions provide the most convenient means of dividing the forms to produce independent slabs. The metal plates are better because they can be kept in position a few hours, and then, if kept clean and well oiled, can be withdrawn without difficulty. The slabs are frequently laid alternately, as in Fig. 7, to secure positive division. In such cases heavy paper is inserted between the slabs previously and latterly placed.

The walk is by no means finished until the slabs have been cured. As soon as the surface is sufficiently hard to resist damage by a fine spray from a hose or sprinkling can, it should be wetted, and kept continually moist for four or five days at least. Failure to cure properly, and overtroweling, are the chief causes of "dusting," and the former often leads to definite loss in strength.

Some other faults in sidewalk construction are well illustrated by the photographs. In Fig. 3, the sidewalk was placed too close to a large tree, the roots of which raised the slab shown in the foreground. The sidewalk shown in Fig. 6 was a failure because of the use of poor, weak concrete, made of dirty materials, insufficient cement, and the poor bond between the base course and the surfacing. In Fig. 4 is shown the effect of a poor subgrade, which has sunk away on both sides, failing to support the walk properly, and causing a "broken back." The displacement of the curb, shown in Fig. 1, could have been avoided, had the slab been laid over the curb section, as shown in Fig. 8; the expansion of the slab would not then have damaged the curb. In Fig. 9, the subgrade of the walk has been undermined, and may cause eventual failure of the walk.

Concrete Borders on Walks Protect Grassplots

Careless pedestrians often ruin lawns along the edges of walks, even though the walks are of sufficient width. A good



The Pyramid Borders Keep Pedestrians on the Walk and Protect the Adjoining Grassplots

method of overcoming this temptation to make a path on the grass bordering the walks is to set a row of low concrete pyramids along the edge of the walk, as shown. They may be cast in blocks, or built in a continuous strip with the walk.

¶When storing cement never pile it directly on the ground, which always contains some moisture.

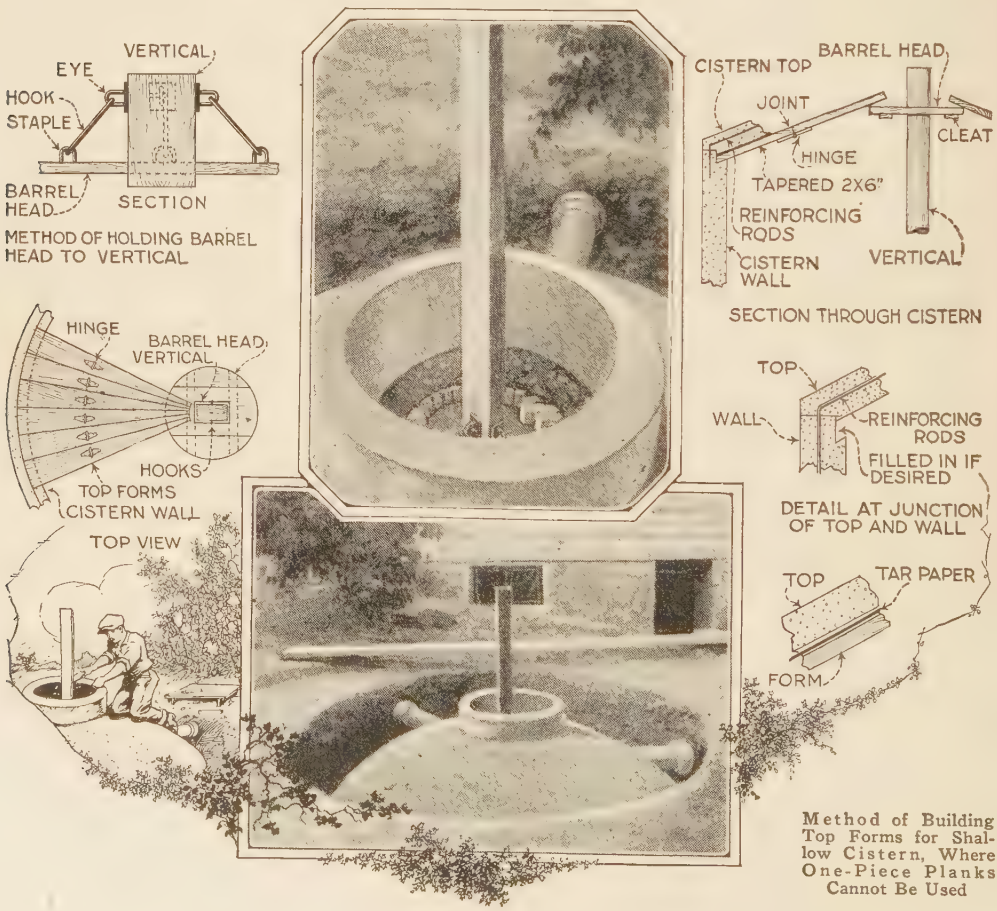
How to Build the Form Work for a Concrete Cistern

By ROY M. SINGER

THERE are many localities where it is necessary to store water. Generally some arrangement is used whereby rain water falling on the roof of a house is let into a cistern and pumped from the cistern as it is needed. The cistern may be made either of wood, steel, or concrete. Concrete cisterns are meeting with a good deal of favor because of the fact that the materials are to be had in practically every locality and because nearly anyone can build them.

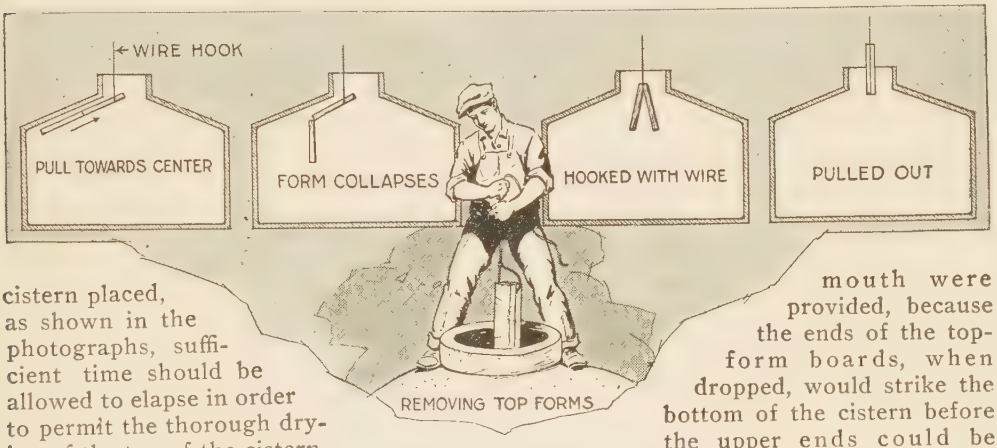
Where deep cisterns are built, the form work is simple, because such cisterns are generally built with wide mouths. For shallow cisterns, however, the situation is different. It is easy enough to erect the forms for a shallow cistern, but taking out the form work is quite a different matter. The sketches shown here illustrate a type of form work designed especially for shallow cisterns with narrow mouths, and it is especially adapted to withdrawal from a narrow space.

In building a cistern of this type, the bottom and walls are put in place first, then the form work for the top is set, as shown in the sketches. The form work consists of a central post to which a barrel head is attached by hooks; spanning the space between the cistern wall and the barrel head are set 2 by 6-in. pieces cut



Method of Building Top Forms for Shallow Cistern, Where One-Piece Planks Cannot Be Used

tapered to fill the circle. These pieces are hinged in the center and it is the hinges that permit the easy withdrawal of the form from the cistern. After the form work has been set up and the top of the cistern placed, as shown in the photographs, sufficient time should be allowed to elapse in order to permit the thorough drying of the top of the cistern. The form should be left in place for at least ten days.

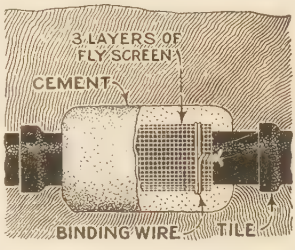


When it becomes time to remove the forms, a wire is attached to the barrel head and the hooks holding the barrel head to the post are loosened. The barrel head is then allowed to slide down on the post until it falls free of the tapered pieces. It will be found that the 2 by 6-in. lengths will stick to the top of the cistern, due to the fact that they are held in place by the notch at the cistern wall and by the adhesion between the underside of the top of the cistern and the wood form. This adhesion may be overcome by placing tar paper upon the form before the top is poured; thus there will be a layer of tar paper between the form and the top of the cistern and the form will not stick.

Now attach a wire to one of the tapered pieces so that it can fall into the cistern, then work it out of the notch in the cistern wall by jiggling it back and forth. It may then be pulled toward the opening. The manner of removing it is best illustrated by the detail drawing. It will be seen here, that as the piece is pulled toward the opening, it collapses at the joint, and the wire may then be pushed farther along until the joint is reached, whereupon the form may be removed. After all the top forms have been taken out, the barrel may be pulled up (be sure that the mouth of the cistern is wider than the barrel) and removed from the cistern, the post then withdrawn, and the job is done. Where a shallow cistern is built it would be impossible to withdraw the forms from the cistern unless an exceptionally wide mouth were provided, because the ends of the top-form boards, when dropped, would strike the bottom of the cistern before the upper ends could be passed through the top opening. This method of hinging, is an easy way to overcome the difficulty.

Cement Repair Job on a Tile

While leveling a lawn, a workman used a pick, and accidentally fractured a tile drain connecting with the sewer. To avoid the work of uncovering the whole pipe and inserting a new section, an effective repair was made with cement as shown in the drawing. The glazed surface of the tile not being satisfactory for bonding the cement, a cover was made of screen, wrapped around the pipe to form three layers, and fastened with ordinary iron wire. A mixture of equal parts of sand and cement was applied around the screen until it reached a thickness of 3 in. The ground under the pipe was filled in to form a mold. There was no leakage though water was allowed to flow through the pipe before the cement had hardened.



¶For good concrete mix the materials for a longer time and use less water.

A Homemade Refuse Burner

By A. J. R. CURTIS

IN thickly built-up residential districts and in localities where alleys are not available, refuse burners prove a great convenience in disposing of rubbish and trash. The design for the concrete burner shown in the accompanying illustration is one which may be depended on for the disposal also of a considerable amount of garbage, provided there is always an excess of paper and other odorless free-burning material. An excessive proportion of pure garbage will create unpleasant odors and therefore should be avoided.

The burner consists of a concrete box, 3 ft. 8 in. square and 4 ft. 1 in. high (above ground) in outside measurements. The walls are 6 in. thick, and extend 1 ft. below the ground. The roof slab is slightly arched, varying from 7 to 9 in. thick. Plain wooden box forms may be used inside and outside. In putting these forms together, the nails should be left protruding slightly to permit easy withdrawal in disassembling. The inside form, particularly, should be well oiled or soaked to prevent swelling caused by the absorption of moisture. The various rectangular openings are made by fastening small box forms between inner and outer main forms as the concrete is placed to the lower level of each opening. See Fig. 1. Similarly, the flue openings may be made circular, if preferred, by inserting short sections of stovepipe between forms. The openings through which the grate-shaker arms protrude are formed by inserting short sections of 1-in. iron pipe. Concrete made of 1 part cement to 2½ parts of sand and 3 parts of pebbles or crushed stone is recommended. The footing is placed in a shallow trench, and vertical reinforcing rods are then placed in position. The reinforcing is done entirely with ½-in. round rods, the verticals and horizontals both being located 12 in. apart, as shown. The roof reinforcing is also of ½-in. rods, spaced 6 in. apart in both directions. After the vertical rods are in place, the horizontals may be wired in position as convenient.

The concrete should be just wet enough to flow nicely into all parts of the mold under light tamping. The forms are removed as soon as possible, any blemishes are immediately touched up with a similar mixture, and the entire surface scrubbed or painted with a creamy mixture of cement and water. The outer forms

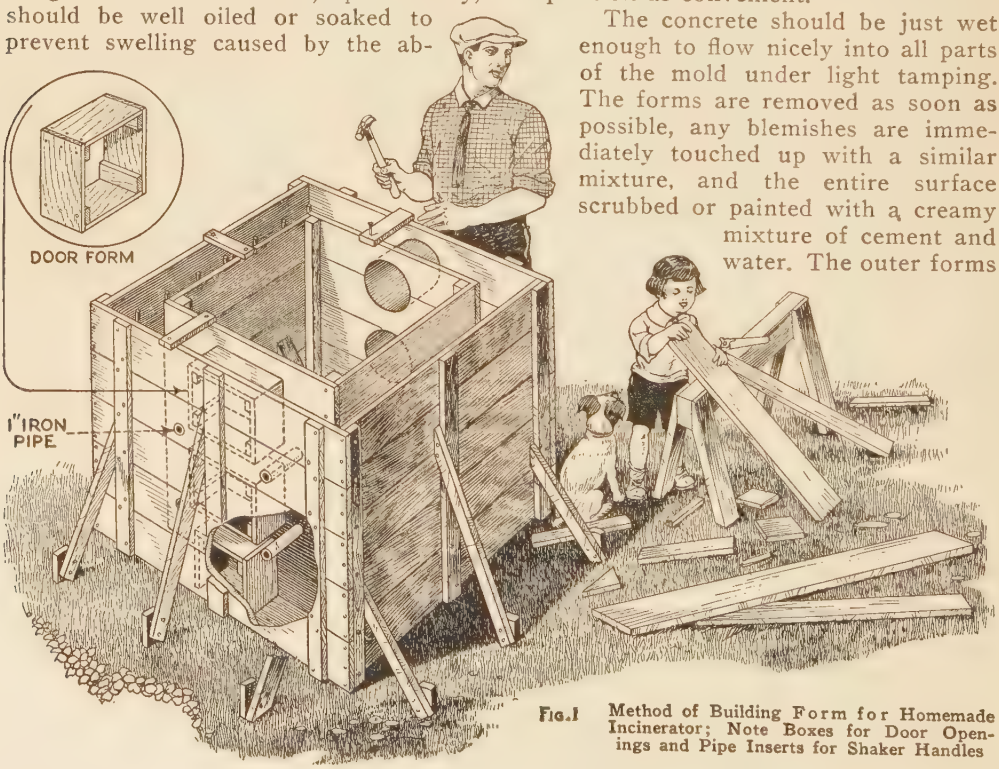
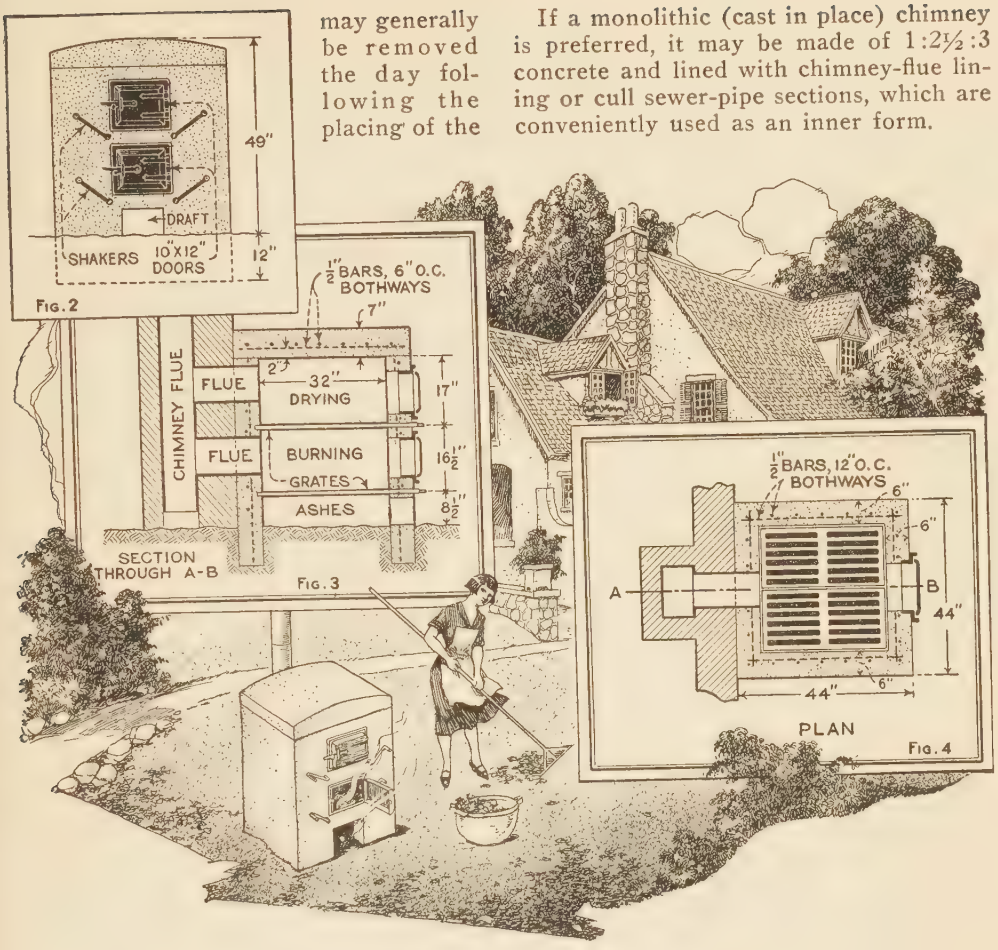


FIG. 1 Method of Building Form for Homemade Incinerator; Note Boxes for Door Openings and Pipe Inserts for Shaker Handles



may generally be removed the day following the placing of the concrete, to permit surface finish. Inner forms may remain longer. Should any portion of the inner form become tightly wedged in, beware of straining the green concrete to remove it; it is far better to let it remain until burned out.

The doors and grates required for the refuse burner may be obtained by ordering (specifying dimensions) from any local hardware dealer. The flues may be attached to a house or other chimney if convenient, or a small chimney construced especially for the burner. Concrete chimney blocks, resting on a solid concrete base, 12 in. deep and with other dimensions somewhat greater than the blocks, may be conveniently used. These blocks have tongue-and-grooved mortar joints, and are easily laid in cement.

If a monolithic (cast in place) chimney is preferred, it may be made of 1:2½:3 concrete and lined with chimney-flue lining or cull sewer-pipe sections, which are conveniently used as an inner form.

Protecting Concrete Sidewalk Crossings

In small towns having unpaved streets, one of the problems is to provide sidewalk crossings that will resist traffic shocks without breaking down. A good concrete crossing can be laid between two old railroad rails. Earth or other road material should always be used to fill in level with the shoulders of crosswalks, in order to protect the concrete, but it is not unusual to see this precaution neglected in many towns. If rails are used, the concrete will be protected whether or not the earth fill is maintained.—W. F. Schaphorst, Newark, N. J.

¶To have good concrete it must be protected, after placing, from sun and wind and from freezing.

Concrete Curbs and Gutters

By JAMES TATE

BUILDING a fine cement driveway or wide walk, without providing gutters, means the eventual formation of irregular and disfiguring natural gutters, with the attendant possibility that the driveway will be undermined. Where the driveway is below grade, a curb is especially necessary, and besides acting as a retaining wall for the higher grade, prevents vehicles from being driven accidentally over the edges of fine lawns.

The simple curbs shown in Figs. 1 and 2 serve excellently for edging gravel walks and drives where gutters are either not thought necessary, or already provided. The method of making the forms for these curbs is quite clear from the drawings; 1 by 8-in. boards are used for the sides, 1 by 2-in. stuff for the cleats, and 2 by 2-in. for the stakes. When placing the concrete in the forms, the trowel or spade should be well worked up and down between concrete and form; this allows the moisture to run to the form, and is a great help in obtaining a smooth surface on the finished work.

The curbs should not be made all in one piece, but the forms should be divided into sections, each 7 or 8 ft. long, by means of loose bulkheads, as shown in the detail, Fig. 1. The concrete is placed in alternate sections, then, when it has just begun to set, the bulkheads are removed, and the remaining sections filled—first filling the joints between the sections with three thicknesses of tar paper, to allow for expansion.

The concrete used in all the work illustrated should be mixed in the proportion of 1 part Portland cement to 2 parts of sand, and 4 parts of clean gravel or broken stone, mixed to a "mushy" consistency.

When building a new driveway or walk, curbs and gutters shown in Figs. 3 and 4 should be used.

When making the form shown in Fig. 3, the facing board—that is, the board forming the face of the curb proper—should be beveled at the bottom to con-

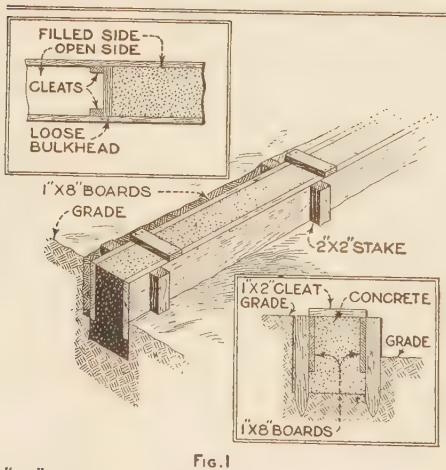


Fig. 1

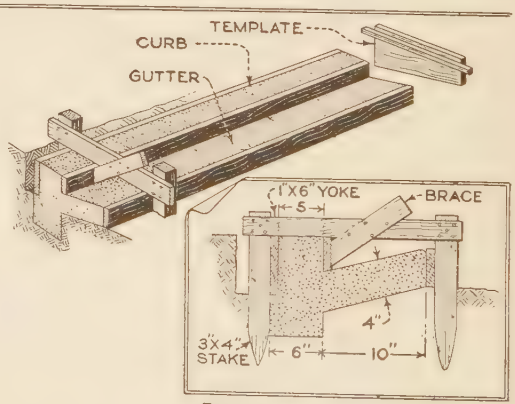


Fig. 3

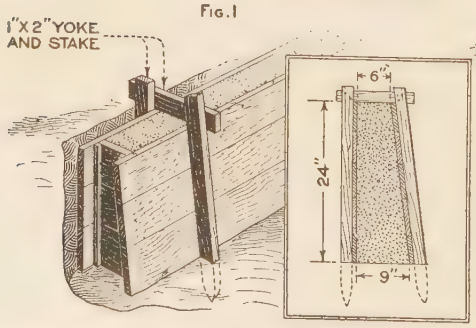


Fig. 2

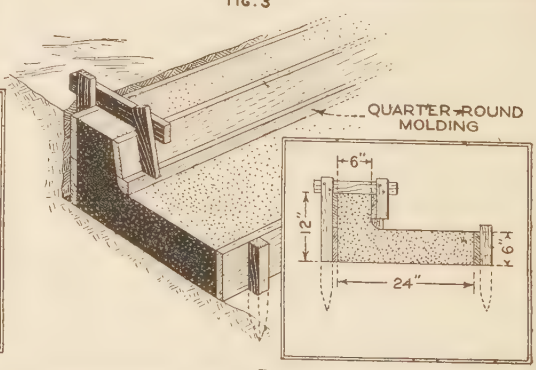


Fig. 4

Figures 1 and 2. Simple Forms for Making Curbs without Gutters. Figure 3. Curb with Sloping Gutter, Cast Integral with It. Figure 4. Another Form of Combined Curb and Gutter

form to the slope of the gutter, and should be braced securely, as shown, every 3 ft. A template, made as indicated, will aid in forming the gutter, after which it should be finished by troweling. The foundation should be carried below the driveway grade, to prevent undermining.

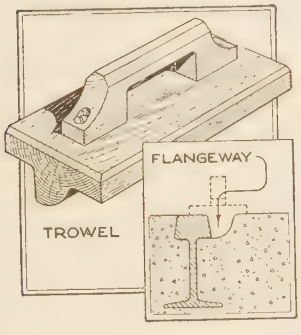
The curb and gutter shown in Fig. 4 may be built with a sloping face, as shown in perspective, or with a straight face, as in the detail. The advantage of the sloping face is that automobiles may be stopped quite close to the curb without danger to tires or rims. Even in the straight form, however, the faces of the form should be given a "batter," or taper of about ½ in. to enable the forms to be removed easily. The outer corners, in all curbs, should be rounded, as a sharp edge is easily chipped, and may soon become unsightly.

Any rough or porous places in the work may be filled, when the forms are removed, with a mixture of 1 part cement and 1 part sand. The exposed surfaces should be finished with a wood float and a wide brush.

The forms should remain in place at least 24 hours—longer if possible—and, as soon as the concrete has set hard enough not to show pits under sprinkling, it should be sprinkled thoroughly, at frequent intervals, for at least two days. The more frequent and prolonged the sprinkling, the better; some authorities favor keeping the concrete wet for seven days.

Special Trowel for Concrete-Road Work

Concrete workers on road-paving contracts are familiar with those jobs in which a groove, or flangeway, must be molded on the inside of street-car or railway tracks, in order to provide clearance for the flanges on the car wheels. The drawing shows a type of trowel used on one such contract, for forming the flangeways. A single block of wood is used for the trowel, which can be cut out on a bandsaw or formed in a pattern shop on a shaper.

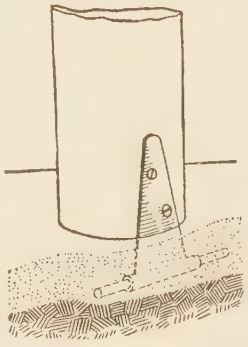


Concrete Aggregate

Sand and pebbles or broken stone are usually spoken of as "aggregate." Sand is called "fine aggregate" and pebbles or crushed stone "coarse aggregate." Sand or other fine aggregate, such as rock screenings, includes all particles from very fine (exclusive of dust) up to those which will just pass through a screen having meshes ¼ inch square. Coarse aggregate includes all pebbles or broken stone ranging from ¼ inch up to 1½ or 2 inches.

Anchoring a Post to Concrete

Wood posts may be attached to concrete floors by setting one-half of a heavy hinge in the wet concrete, allowing sufficient length above the surface to admit two of the screw holes. When the cement is dry the post can be fastened to its support with screws. The hinge can be reinforced by inserting a piece of rod iron into the hole before the cement is tamped in around it.—Paul H. Burkhart, Blue Island, Ill.



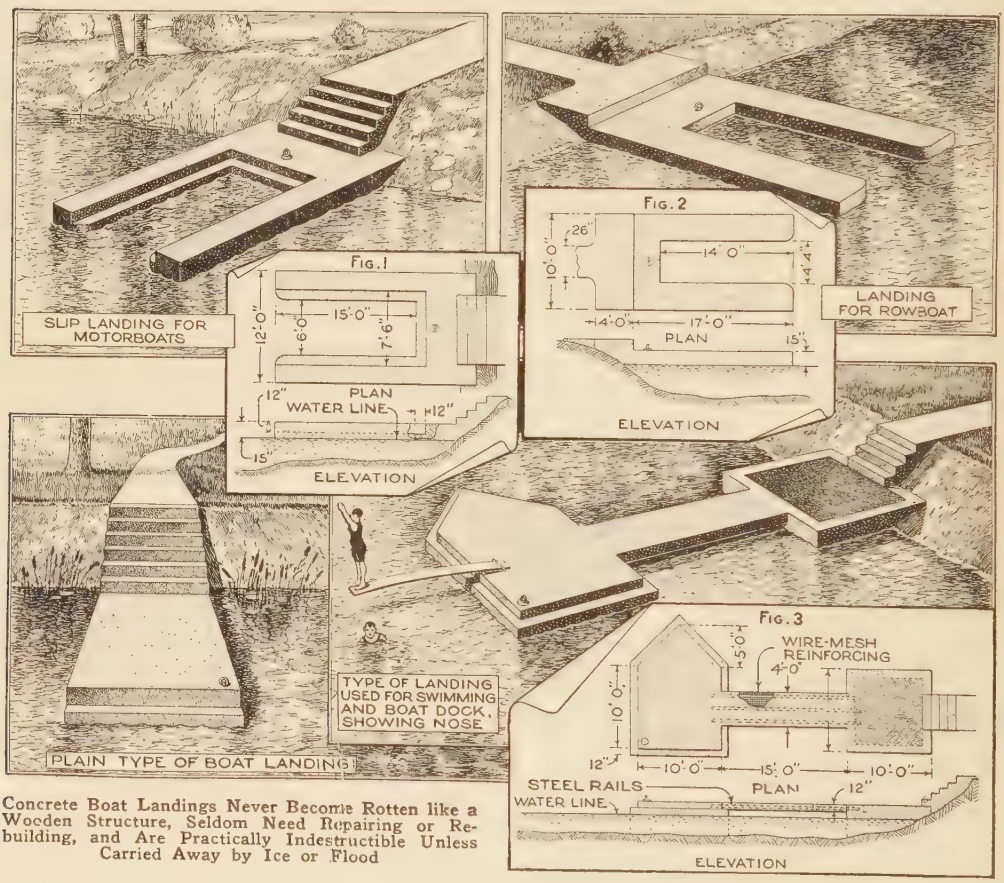
Coarse Sand Needed

Where strength and wearing qualities are demanded of cement work, the sand to be used should contain an excess of coarse particles. Fine sand is necessary in a mixture only in the grading of the whole bulk of sand, to reduce the volume of air spaces or voids in the mass. To be well adapted for cement work, the greater part of the sand should remain on a 50-mesh sieve—a sieve containing 50 linear divisions to the inch or 2,500 holes to the square inch. Not more than 6 per cent should go through a 100-mesh sieve. All particles passing ¼ in. mesh are regarded as sand in such work. Small particles of clean stone from rock crushers, known as "screenings," if from hard durable rock, answer as well as sand. River sand averages well because usually the mud has been washed out of it.

Concrete Boat Landings and Docks

By JAMES TATE

A BOAT landing at the summer home, or resort, is something that is frequently lacking, and in most cases where one exists, it is, as likely as not, a rickety structure supported on a few half-rotted posts. Such a landing is not only unsafe but unsightly, requires frequent repairs, and, from time to time, rebuilding. The disadvantages of wooden structures cannot, however, apply to a boat landing made of concrete. A little more work will be required to build the necessary wooden forms, but once constructed, the job is practically everlasting, and repairs are seldom if ever necessary.



Concrete Boat Landings Never Become Rotten like a Wooden Structure, Seldom Need Repairing or Rebuilding, and Are Practically Indestructible Unless Carried Away by Ice or Flood

The drawing shows four types of landings and docks; dimensions are given for three, and all are suitable for the accommodation of the average small boat. Neither the style nor dimensions given need be adhered to, of course, but can be altered in any way desired.

In the construction of a boat landing, as well as in the building of any other monolithic structure, a form is required to contain the concrete mixture until it sets. A form for the construction of work of this character is made by driving boards or sheet piling into the bed of the stream, to form a hollow, into which the concrete mixture is poured and tamped. In making the form, care should be taken to have it well braced, so that the weight of the concrete will not force it apart. Also, the boards forming the sides of the form should be close enough together to prevent a free flow of water through the form, as this would have a tendency to wash away the cement binder, leaving an imperfectly bonded mass consisting largely of broken stone. It does not make any particular difference whether or not there is water inside the form; if it can be pumped dry, all the better, but this is not necessary. The concrete will harden under water, although at a slower rate than when exposed to the air.

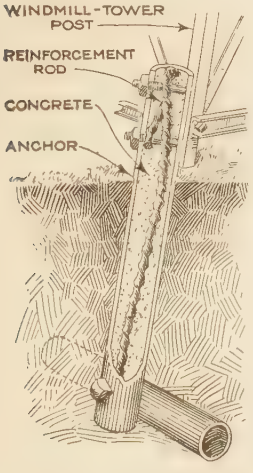
The mixture for work of this kind

should consist of at least 1 part cement, 2½ parts sand, and 5 parts of crushed stone or screened gravel. A little more cement than the above quantity will not hurt, however. All the ingredients should be thoroughly mixed before adding water, and when the water is added, the mass must be mixed again until every stone and grain of sand has its coating of cement. In this manner the strongest possible mass will be obtained once the cement has set or hardened.

The estimated materials required for landings of the style and dimensions shown are: for Fig. 1, cement 38 bbl., sand 14¾ cu. yd., and stone 29 cu. yd.; and for Fig. 2, 33½ bbl. cement, 12.8 cu. yd. sand, and 25½ cu. yd. of broken stone. The plain type of landing shown in the lower left-hand corner is built to meet individual requirements, and no dimensions or estimate of materials are given. The rather elaborate style of Fig. 3 is built in two parts, which are connected by means of a reinforced runway above the water line. The nose of the outer pier is pointed upstream to break up floating blocks of ice, and the inner pier is cast hollow, being afterward filled in with well-packed earth. The materials required for this landing, built to the dimensions given, are cement 46½ bbl., sand 18 cu. yd., crushed stone 35 cu. yd., woven-wire mesh, 3 sq. yd., and old steel rails, 60 ft. Eyebolts and rings, on which to fasten the painters of the boats, and a bracket for the end of the diving board, are imbedded in the concrete as shown.

Reinforcing Windmill Anchor Posts

When a windmill was built, about 15 years ago, 3-in. pipe was used for the anchor posts, in the belief that it would last as long as the wooden tower. However, the anchors gradually rusted until they were no longer safe. In order to replace them with a minimum of trouble, reinforcing rods were placed in each post at one side of the anchor bolts. The pipes were then filled with a free-running mixture of sand and cement, which was thoroughly tamped. Now, even though the metal may rust entirely away, the anchor posts will be as strong as new ones. The concrete filling should be mixed in the proportion of two parts sand to one part cement, and should be of a quaky consistency.

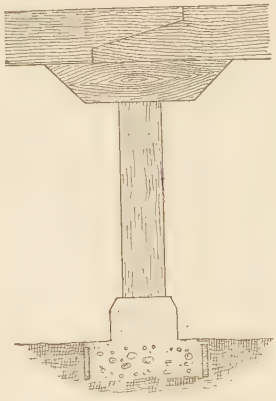


Protecting the Edges of Concrete Tanks

A band of 3/16 by 2-in. strap iron, bent to shape, bolted, and inserted in the forms, will protect the edges of a concrete watering tank against breakage caused by weathering or by a wagon being driven against it.

Foundation Supports

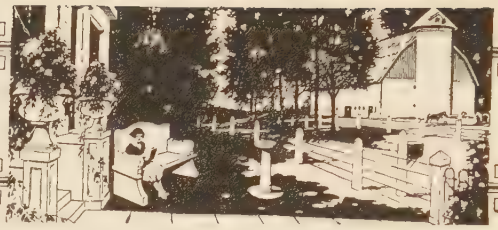
In the accompanying illustration is shown a method of placing a concrete base for foundation posts. For an ordinary house, the concrete should be below frost line and the top part built up about 1 ft. high, finished smooth for the sake of appearance. This keeps the timber away from the earth and dampness, preventing rot. The timbers are jointed in the usual manner and set on a corbel placed on top of the post.—Geo. Niesen, Chicago, Ill.



Preventing Decay of Buried Posts

A simple method for preventing the decay of posts supporting rustic structures and, in fact, wherever a post is buried in the ground, consists in inserting the post in a concrete-filled section of drain tile.

The post hole is dug and the tile inserted. Several inches of concrete mixture are poured into the bottom, the post put in position, and the surrounding space between the post and tile filled with a mixture of 1 part cement and 2 parts sand.



Making Concrete Fence Posts on the Farm

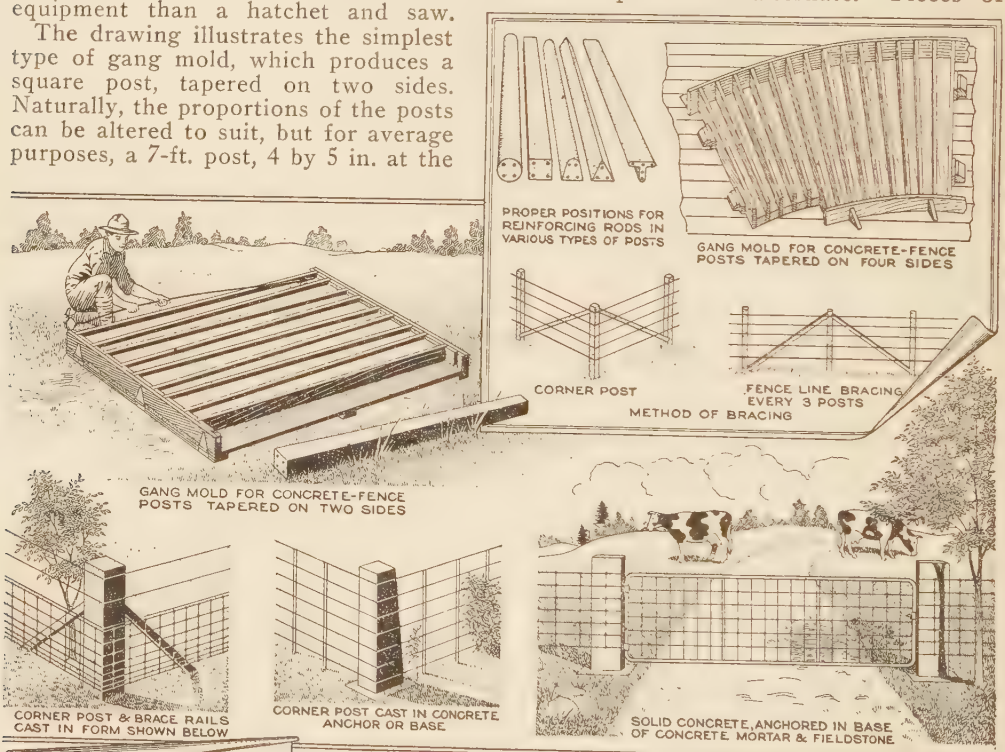
By JAMES TATE

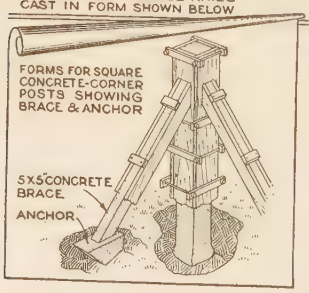
NO expensive apparatus is required for the manufacture of concrete posts, as the simple molds can be easily made by anyone with no more tool equipment than a hatchet and saw.

The drawing illustrates the simplest type of gang mold, which produces a square post, tapered on two sides. Naturally, the proportions of the posts can be altered to suit, but for average purposes, a 7-ft. post, 4 by 5 in. at the base, and 3 by 4 in. at the top, will answer admirably. One-inch lumber should be used in making the mold, which may be stationary or portable, and as large or as small as desired. The lumber should be dressed on both sides. The endpieces are hinged to the bed, and alternate 4 by 5-in., and 3 by 4-in. spacing blocks are attached 1 in. apart, so that the small and large ends of the posts will alternate. Pieces of board are inserted in the grooves formed between the blocks to separate the individual posts.

Another and more elaborate type of mold for forming posts tapered on four sides is shown, but the construction of this mold requires a number of tapered pieces, making it more costly. It will be noticed that this mold takes the outline of an arc to obtain the desired taper.

A 1:2:3 concrete mixture is recommended for concrete fence posts, the fig-





Casting Concrete Fence Posts Is an Operation That can be Profitably Undertaken during the Winter Months. The Equipment Needed Is Simple, and the Resulting Posts will Prove More Economical, in the Long Run, than Wooden Ones

ures indicating that one part of cement, by volume, not weight, to two parts of clean, sharp sand, and three parts of coarser aggregate, such as gravel, are used to form the concrete mixture that is tamped down into the molds, which should be oiled before pouring begins.

To strengthen the posts and give them additional rigidity, they are reinforced, as indicated, with iron rods. For this type of work the reinforcing rods need not be more than ¼ in. thick; heavy fence wire, if in good condition, either plain or barbed, can be used if it can be straightened economically.

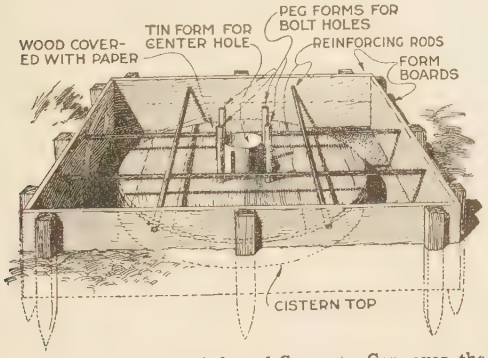
To form the mortises, which are necessary for bracing corner posts or for bracing the fence line, triangular wooden blocks are inserted into the molds before the concrete is put in, if the braces are to be cast separately. Concrete corner posts and gateposts should be made somewhat larger than the others, and if only a few are to be made, they can best be poured on the job in a simple box form held together with clamps, as shown in the lower left-hand drawing. In the case of concrete gateposts, the hinges are inserted into openings made in the form for them, and, after the cement has hardened, there is no sagging of the gate.

After being placed, concrete should be left in the mold two or three days to harden. When the endpieces and partitions are removed, the posts should be left on the bottom board, in the shade, for a week or 10 days, protected by a layer of straw, which should be kept moist so that the concrete will "cure" slowly, rather than dry out.

After this period, posts may be stored outdoors, piled in the same manner as wooden posts; they should be handled with great care, as a slight drop may break a fresh post. Concrete posts may be used when 30 days old, but not sooner.

Reinforced-Concrete Cistern Cap

A cap for a cistern can be made easily of reinforced concrete, as will be described. A cover of this material has the advantage that it will withstand the effects of the elements indefinitely and that it will not foul the water. The procedure is this: Fit planks over the opening of the cistern. Then lay a sheet of heavy paper over these boards. This prevents the concrete from sticking to the wall or leaking through the cracks. Arrange the form boards, which should be 4 or 5 in. high, around the outside, as



Form for Casting Reinforced-Concrete Cap over the Top of the Cistern on Which It is to be Used

shown in the drawing, and support them in position with stakes. Then bend a strip of sheet iron into a hollow cylinder of sufficient diameter to admit the pump cylinder. Set this form in the center to provide an opening for the pump. Place heavy iron rods for reinforcing, in the form, as shown, and fill the form with concrete. Before the concrete has set push into it vertically, down to the wooden cover, four cylindrical sticks of wood. These should be located to correspond with the bolt holes in the pump base. After the concrete has set remove the form and bore out the wooden rods for the bolt holes setting these in place with cement-sand mortar.

Attaching New Concrete to Old

In a foundation or other structure where the strain is chiefly compressive, the surface of the concrete laid on the previous day should be cleaned and wet, but no other precaution is necessary. Joints in walls and other locations liable to tensile stress are coated with mortar, which should be richer in cement than the mortar in the concrete, proportions 1 to 2 being commonly used.

The adhesive strength of cement or concrete is much less than its cohesive strength, hence in building thin walls for a tank or other work which must be water-tight, the only sure method is to lay the structure without joints. If the wall is to withstand water pressure and cannot be built without joints, both horizontal and vertical joints must be first thoroughly cleaned of all dirt and powdery scum, and then wet and covered with a very thin layer of neat cement, or 1 to 1 mortar, according to the nature of the

work. As an added precaution, one or more square or V-shaped sticks of timber, say 4 or 6 in. on the edge, may be imbedded in the surface, or placed vertically at the end of a section, of the last mass of concrete laid each day, says The Concrete Review. In some instances, large stones have been partially imbedded in the mass at night for doweling the new work next day. Roughing the surface after ramming or before placing the new layer, will aid in bonding the old and the new concrete.

Mixing Concrete

In tests carried out by the Bureau of Standards, it has been found that the workability of concrete increases with the time of mixing. The quantity of water being kept constant, the change is particularly apparent between 30 seconds and one minute, not changing much thereafter.

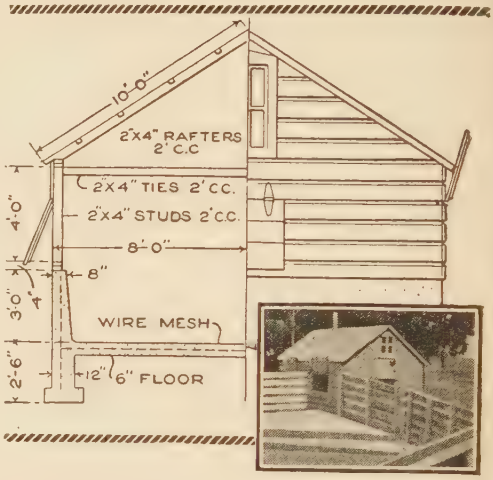
It is possible, for instance, to obtain the same ease of working by mixing for one minute with a given amount of water, as by mixing one-half minute with 25 per cent more water. This information should prove of value to contractors in locations where water is at a premium.

Roofed Watering Tank of Concrete

A large concrete watering tank, having a frame superstructure over it, was found practical on an Iowa farm. Its large size enabled the farmer to use plenty of water in spite of adverse weather, when the windmill could not be operated. The roof over the water kept it cool in summer, and aided in keeping the water supply pure. The original was made 16 by 20 ft., but the method of construction may be applied readily to smaller tanks.

A strong foundation of concrete, having a 24-in. footing and a 12-in. wall, tapering to 8 in. at the top of the tank, was poured in forms and served as the tank proper. The 6-in. floor and the walls were reinforced with heavy wire mesh. The tank was made to extend 3 ft. above the floor level, and bolts were set into the top of it, to provide a fastening for the frame portion. The latter was made of 2 by 4-in. material, with double pieces for the sills. The rafters and other details are of standard construction. Windows were set in the gables, for light and ventilation, and several doors, hung horizontally on hinges, were fitted in the sides and ends. The sides and ends were finished with matched siding, set horizontally.

The openings are spaced in relation to the fenced parts of the barnyard, so that



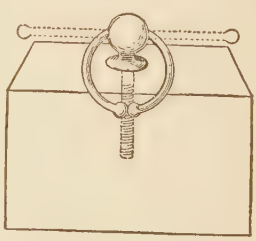
The Concrete Watering Tank was Built at the Center of the Barnyard, Giving Access to Stock in the Various Sections

each type of cattle has separate access to the tank. The tank was set in the center of the adjoining sections of the barnyard for this purpose.

The top of the concrete wall should be leveled carefully, to provide a satisfactory foundation for the frame structure. The tank should be finished, especially inside, with a smooth coating of a creamy mixture of cement and water, six days after pouring the concrete in the forms, the latter being removed at that time. The intake and overflow pipes must, of course, be provided for when the forms are set up; they can easily be set in holes bored in the forms.

Hitching Ring for Cement Horse Block

With any scrapped jaw screw from a bench vise a neat and serviceable hitching ring can be made, by first bending the ends of the lever together, as shown, and then sinking the screw into the cement, leaving the ball or head flush with the surface of the block.—Wm. J. Tolson, Lyons, Iowa.



A Concrete-Block Milk House

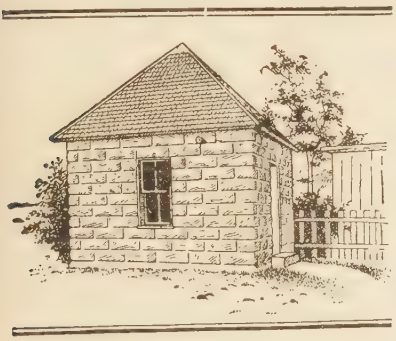
By W. E. FRUDDEN

THE use of concrete in the construction of small farm buildings means the substitution of an everlasting, non-decaying type for those constantly in need of painting and repairs. Concrete construction is fire-resisting and has many other points in its favor, and has become a very popular building material among farm owners. The concrete-block milk house is most ideal. It is permanent and sanitary, and will last indefinitely. Such a structure is shown in the illustration. The one built is 12 ft. square and made entirely out of concrete, except the roof, which is of frame covered with cedar shingles. The materials for the building are as follows:

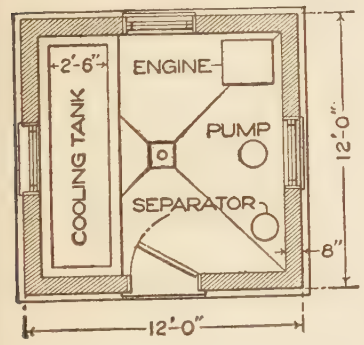
7 bbl. of cement.
3 yd. of sand.
5 yd. of screened gravel, or stone.
4 pieces for plates, 12 ft. long, by 2 by 8 in.
12 pieces for rafters, 10 ft. long, by 2 by 4 in.
7 pieces for crossties, 12 ft. long, by 2 by 6 in.
3 window frames.
1 door frame.
3 windows, 4 ft. 10 in. by 12 in.
1 door, 2 ft. 8 in. by 7 ft.
240 ft. of sheathing for the roof.
2,000 cedar shingles.
275 concrete blocks for the walls.

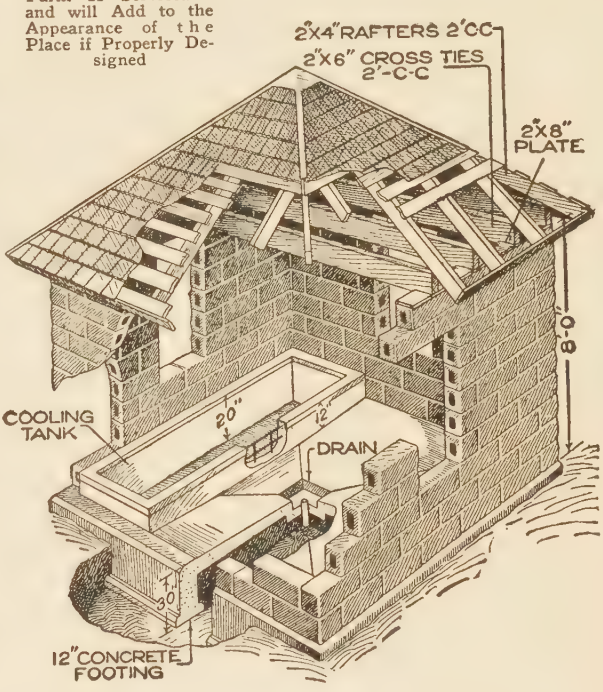
The building rests on a 12-in. foundation, that extends down below the frost line and is flared out at the base, as shown. Mix the concrete with 1 part cement, 3 parts sand, and 5 parts well-graded gravel, and pour into the trenches carefully so that dirt will not fall into the mixture.

The rules for the laying of concrete blocks, which are used in the walls, are very simple. Neat and rapid work can be done without much training. The equipment necessary is inexpensive and can be built on any farm. The things needed are a mortar-mixing box, about 3 by 5 ft.; a mortar board, about 30 in. square, made of 1-in. lumber; a trowel, a hand level, a straightedge, and a plumb board. Soak the blocks before laying them, or they will take up the moisture in the mortar and thereby weaken it. Lay the block walls up true and plumb, and in a perfect line, and test frequently to see if they are level. Good cement mortar is made in proportions of 1 part cement and 2 parts sand, mixed with enough water to make it of the required consistency. Cement mortar starts to harden very quickly, and it is best to mix up small



A Concrete-Block Milk House for the Farm Is Serviceable and will Add to the Appearance of the Place if Properly Designed





batches at a time, or enough to be used in less than one hour's time.

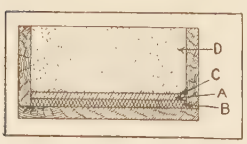
A 2 by 8-in. plate is bolted to the top course of blocks, and the roof rafters are spiked to it in a substantial manner. The rafters are 2 by 4-in. material, spaced 2 ft. from center to center, and covered with sheathing and cedar shingles, laid 4½ in. to the weather, and fastened with galvanized shingle nails.

The milk-cooling tank is made of concrete, and is 2½ ft. wide. Where the standard 14-in. cans are used, this width will be just right for two rows of cans. The tank used was built to extend a short distance below the floor, which allows the farm hand to lift the cans with ease by obtaining a maximum purchase at the point where the cans are hardest to raise, or just when they are leaving the water. The floor of the cooling tank is just 8 in. below the grade of the milk-house floor. The tank is 20 in. deep inside. The standard-size milk cans, when resting on the bottom of the tank, will then be surrounded by water up to their necks. The tank is made of concrete in one operation. The floor of the tank is 6 in. and the walls 4 in. thick. The concrete is reinforced with ¼-in. rods, spaced 7 in. the long way, and 12 in. the short way. The rods are bent up into the walls of the tank and are tied securely at all intersections with wire.

Concrete for the cooling tank is mixed to a quaky consistency, using 1 part cement, 2 parts sand, and 3 parts of screened gravel, or stone. The top edge of the tank, over which the cans must be lifted, should be protected with a 4-in. channel iron, which is anchored to the concrete wall every two feet.

How to Marbleize Concrete

To produce a concrete face that will have the appearance of sanded-finish marble, such as used for exterior building stone, is very successfully done on any face-down block machine by first covering the face to the depth of ⅛ in. with a mixture of 1 part cement to 3 parts marble dust, and the regular mixture of concrete is then placed upon it and tamped in the usual way, sufficient moisture penetrating the dry facing to produce a hard face.



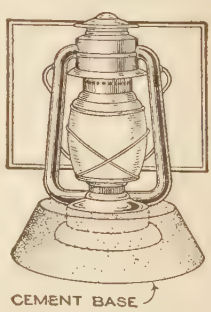
Marble dust from the Vermont quarries produces the smoothest surface, but is more troublesome in adhering to the mold than Georgia marble dust, which is of a flint or crystalline nature. Facing made as above may be polished or glossed after the blocks are five or six weeks old by polishing much the same as natural marble.

A cheaper method of producing polished or glossed marble surface is to construct a mold as shown in the sketch, which is the same as any ordinary artificial stone mold, except that on the bottom or face side is placed a polished plate glass, A, which rests on a rubber blanket or mat, B, to save breaking the glass when tamping. On the glass is placed to the depth of ⅛ in. a composition made of 1 part Portland cement and 3 parts marble dust, C, mixed with sufficient water to admit placing. This composition must be well agitated until placed, and then is immediately covered with rather a dry concrete-block composition, D, which must be well and carefully tamped, and the mold left undisturbed for at least one day, when the block or slab is removed and seasoned.

When a highly polished glass and fine marble dust is used the surface is perfect, and it sometimes is necessary to slightly warm the glass to free the block from it. Such surface can be highly glossed by vigorous rubbing with felt frequently dampened with a solution of 1 part oxalic acid to 6 parts clean water. All acids must be washed off the block with clean water as soon as the desired gloss is obtained.

Cement Bases for Lanterns

Lanterns that are used by contractors and municipalities to warn traffic against obstructions or dangers in the roadway are easily upset and extinguished by the wind, when set on the ground. If suspended from a barricade or stake there is frequently considerable swaying that may dislodge the lantern and extinguish the light. However, by molding a cement base around the oil reservoir of the lantern it can be set on the ground with every assurance that it will not be blown over or accidentally upset.



MAKING WATERING TROUGHS IN CONCRETE

By E.R.Haan

THE advantages of concrete watering troughs on the farm are obvious. Troughs made of wood and iron are short-lived, especially if they are not kept filled to a constant level, and they deteriorate even more rapidly if built below ground than if built above it. Besides, the rust and decay incident to the use of wooden or iron troughs foul the water they contain, while in concrete troughs, if kept clean, the water remains pure and sweet. Concrete troughs are, moreover, not only easy to build, but cost considerably less for maintenance than wooden or iron ones, as it is not necessary to drain and paint them periodically.

While this article specifically refers to watering troughs for stock, exactly the same procedure is employed in making tanks for storage of water, so that these remarks, and the following directions may be taken as applying to storage-tank construction as well.

Tanks may be made either round or rectangular. The round tank requires less material for a given capacity than a rectangular one, but is more difficult to construct, except when a concrete silo is being erected, when the same forms can be used in making the tank.

The construction of the rectangular tank will be taken up first.

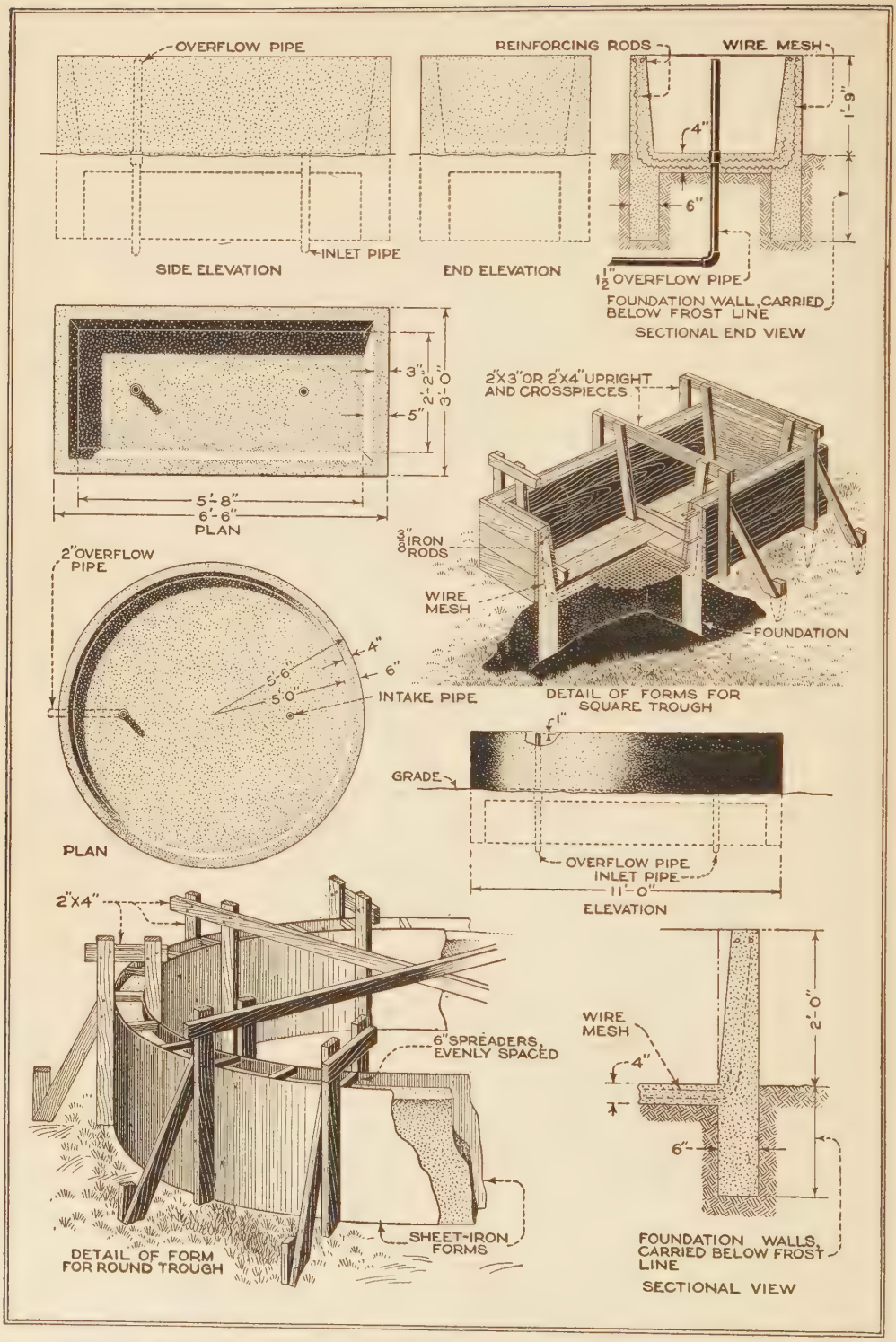
The trenches for the foundation are dug well down below the frost line, and the pipe lines for inlet and overflow laid down at the same time. The trenches being finished and the pipes laid, the construction of the forms may be taken up. Forms for concrete work should be made of green lumber, as seasoned wood will warp and swell, owing to the moisture in the concrete. The boards used should be planed, and dressed on both edges, as a form made of planed boards is easily cleaned, and the dressed edges allow the form to be made "tight." This is a necessary feature, for, if any cracks or gaps are left in the form, the cement in the mixture will leak through, leaving a porous spot in the wall. If the forms are well soaked with water, after assembly, there will be little possibility of leakage. Tongued-and-grooved boards, while not essential, make the best form, and leave a good, smooth finish on the completed work.

Lumber 1 in. thick is used for the forms, and the braces are made of 2 by 4-in. stuff. The outside forms are braced to stakes, driven into the ground, as shown. The concrete used for the work is mixed in the proportion of 1 part cement to 2 of sand, and 4 of clean, broken stone. When the foundation has been poured and the outer forms erected, spread about 1 in. of concrete over the earth that carries the bottom of the tank proper, cut the lower piece of wire-mesh reinforcing to size, and lay it in place, carrying it up along the sides, as indicated. Lay about 1½ in. more concrete over the bottom, place the smaller section of mesh, and lay the remaining 1½ in. of concrete. The inner form, which must be ready before the pouring operation is started, is then hung in place, as shown, and the side walls poured; the concrete must be of a "quaky" consistency.

The forms must be liberally slushed with linseed or crude oil, before pouring, to prevent the concrete from sticking to the lumber.

The concrete, while pouring and afterward, must be thoroughly poked and rammed into all corners, and churned with a long iron rod, so that it will be homogeneous and waterproof. If this part of the work is done thoroughly, there will be no need of applying waterproofing compounds, but it is absolutely necessary that no porous or incompletely filled parts exist in the walls, and this can only be prevented by painstaking rodding. Tapping the forms all over lightly with a hammer will aid in giving the concrete a dense, smooth surface, eliminating subsequent troweling.

The inlet pipe for the tank should be flush with the bottom of the form, and may be temporarily plugged while pouring. The overflow pipe should be about 1 in. below the level of the walls. Reinforcing rods, ⅜ in. in diameter, are inserted around the tank in all four walls, near the top, although they are only



Construction of Concrete Watering Troughs: Above, Details of Forms and Dimensions for Rectangular Trough, Showing How Inner Form is Braced and Hung from Outer One; Below, Form Made of Sheet Iron for a Circular Trough, If Silo Forms Are Not at Hand. The Interior Taper is Formed by Hand, on the Circular Trough, After the Inner Form is Removed. The Edges of the Tanks may be Rounded, If Thought Necessary, While the Concrete Is Still "Green" and Easily Shaped

shown in two in the drawing. No stops should be made in the work once the foundation has been poured; the pouring should be as continuous as possible until the work is completed.

The inner forms can be removed in 24 hours, and the inside surface of the tank painted with a neat-cement wash. The tank should be soaked with water twice a day for two weeks, when the outer forms may be removed, and the tank put in service. The upper edges of the tank may be rounded while the cement is still soft, if desired. The material necessary for a tank of the dimensions shown is approximately 1.66 bbl. cement, .55 cu. yd. sand, 1.10 cu. yd. broken stone, 9 sq. yd. ½-in. square wire mesh, and 70 ft. ⅜-in. reinforcing rod.

If no silo forms are available, the circular tank may be constructed as shown in the lower illustrations, using heavy sheet iron to form the side walls.

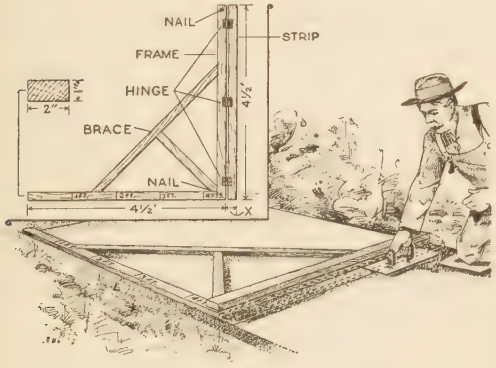
The foundation is laid as for the rectangular tank, and the wire-mesh reinforcing placed in the same manner. The inner sheet-iron form must be securely braced, as shown, when hung from the outer one, and spaced from it by 6-in. wooden spreaders, which are moved upward as the concrete is deposited. The reinforcing rods are bent into hoops and placed in the concrete so that the joints come as far apart as possible. Three hoops are used, so the joints should be placed 120 degrees apart. The inlet and overflow pipes are placed as before.

The inner form should be removed as soon as possible, and the inner taper formed on the tank by troweling or cutting the cement as indicated by the dotted line in the sectional view. The inside taper on both tanks is important, as when ice forms on the water it tends to slip up the sides of the tank rather than exert pressure against them. After painting with a cement-water mixture, the tank is cured for two weeks.

The material required for the tank is 4.40 bbl. cement, 1.40 cu. ft. sand, 2.80 cu. yd. broken stone, 24 sq. ft. wire mesh, and 125 ft. ⅜-in. reinforcing rod.

Folding Square for Dividing Concrete Sidewalks

The sketch shows a square for rapidly cutting cement sidewalks into blocks, 4 ft. long, or any other dimension. It is designed as an improvement on the method of pencil marks made on the forms, which are obscured by the concrete and are seen with difficulty. The frame may



The Folding Square Divides Cement Sidewalks into Even Squares That Are Accurate

be made of 1 by 2-in. material and each arm should be about 4½ ft. long. Drive nails through as indicated, projecting about ¼ in. to prevent slipping of the square. The strip at the right swings on hinges. The distance X should be the same as the distance from one edge to the center of the sidewalk center tool, which varies from 1¼ to 1 7/16 in. As soon as the block is cut at the edge of the strip, the strip is turned back, and the sidewalk center tool run across the block, keeping one edge of the tool against the frame. The square has been found to be convenient and rapid.—J. W. Muncey, Jesup, Iowa.

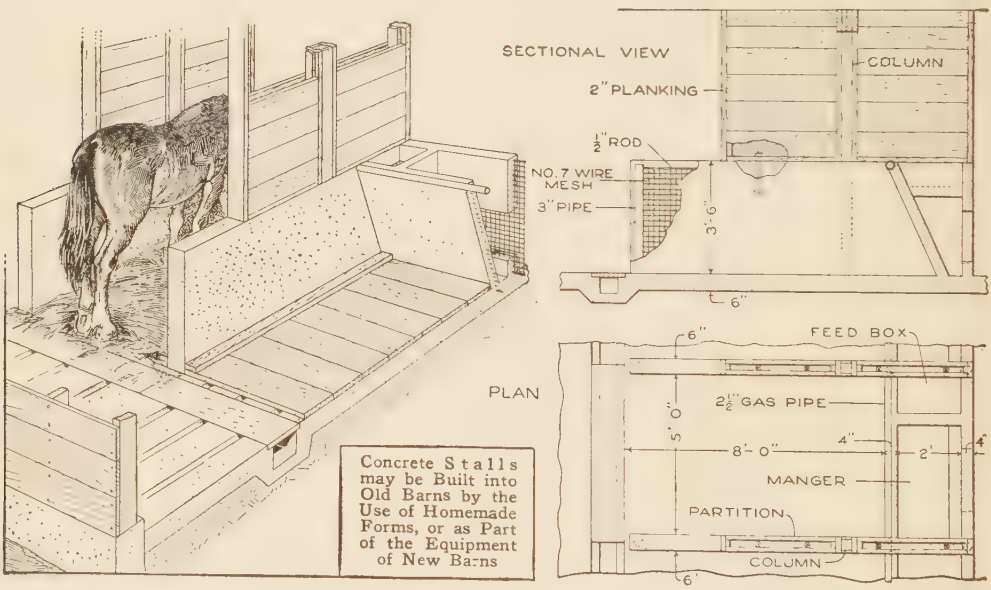
How to Avoid Construction Joints

Any large piece of concrete work should, if possible, be started early enough to insure its completion the same day and thus avoid construction joints between one day's work and the next. If it is necessary to stop work on a wall or foundation before it is finished the concrete should be brought to a level in the forms and the surface prepared to receive the next day's work by placing pebbles projecting halfway out of the concrete or by roughening the surface with a trowel. This will make a better bond. Before concrete work is commenced the next day the top surface of the hardened concrete must be cleaned. If too much water has been used a creamy scum will be found which must be cleaned off. Then coat the surfaces with a paste of cement and water just before new concrete is applied.

Horse Stalls of Concrete

By W. E. FRUDDEN

SERVICEABILITY and sanitary considerations make concrete desirable for the building of horse stalls. The illustration shows stalls of this type that may be built into a new structure in various units, or fitted in an old one. The floor, drain trough, feed box, manger, and partitions are built as a unit, and wooden partitions are set above the concrete sections. A removable plank floor in the stalls gives the horses foot comfort, not possible upon even a heavily bedded concrete floor. The concrete partitions and the mangers are reinforced with wire-mesh and steel pipes. The front edge of the manger is also guarded with a pipe, so as to prevent undue wear on the harness. The edges and corners of the exposed concrete should be rounded off so as to prevent injury to the horses from accidental contact in entering and leaving the stall. A stall in use and another in section are shown to the left in the sketch; a plan view is shown at the right, together with a detailed view of the partitions and manger.



Concrete Stalls may be Built into Old Barns by the Use of Homemade Forms, or as Part of the Equipment of New Barns

The floor is laid down first, and of the same material used for the other concrete portions, a 1 to 2 to 4 mixture. A weaker mixture may be used for the floors, if there is a considerable area to be laid. The drain trough, 6 by 6 in. in section, is cast with the floor, a box of ⅞ in. stock being fitted into the floor as a mold. The shallow drain grooves may be tooled into the surface, and the offsets at the top of the trough are provided by strips fixed to the trough mold. The 3-in. pipe reinforcing the partitions at their rear ends, is set into the floor when the latter is laid, and it is desirable, also, to set the lower edges of the wire-mesh reinforcement into the floor.

Wooden forms are provided for the partitions and the manger. These should be built to be taken apart readily so that they may be used repeatedly. The form for the partition is a box in which the wire-mesh is supported, taut and carefully centered, the mixture being poured into it and leveled at the upper surface. The forms for the manger and feed box should be set into place and fixed to the partition forms before any of the forms are filled. The inside of the manger is formed by a tapered box resting upon the floor. The feed box is poured around a similar but smaller form, and the portion below it is cast hollow by inserting a form, which remains in place after the concrete is poured into the molds. A 2½-in. pipe is set into the front edge of the manger, its ends being imbedded in the partitions, to protect the horses from the edge of the manger and to prevent heavy wear on the harness. Bolts to support the upper portions of the partitions are set into the concrete, as indicated in the sectional view, to the left of the column.

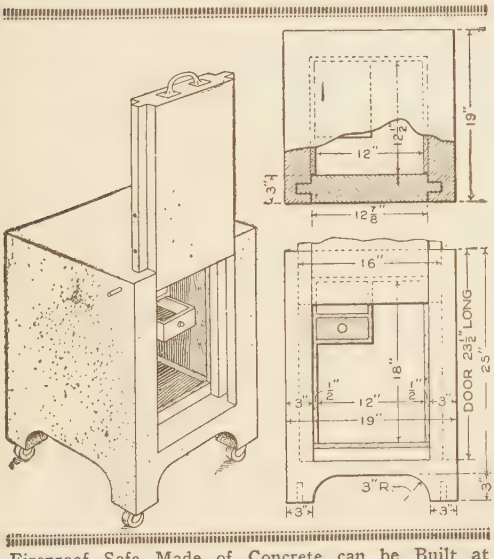
The mixture must be freshly mixed and thoroughly wet when being poured, in order that the molds may be filled properly. If necessary, the aggregate may be tamped into the molds slightly.

The forms should be left in place three days, and then removed carefully, so as not to damage the concrete. Sprinkling the work occasionally, several days after the forms are removed, is also desirable as an aid in uniform drying. The surfaces should be smoothed by removing the imperfections in the molds, and a mixture of cement and water should be brushed over them to produce a satisfactory finish, when the molds are removed. The work may be surfaced and troweled smooth if desired, but this is not essential.

The floor planking is laid crosswise and spiked to 2 by 4-in. pieces set at the sides of the stall. This arrangement makes it convenient to replace pieces of the planking where the greatest wear occurs, and the planking may be removed readily, in one piece, when it is necessary to flush out the stall.

How to Make a Fireproof Concrete Safe

The chief features of this safe are simplicity in construction and cheapness.



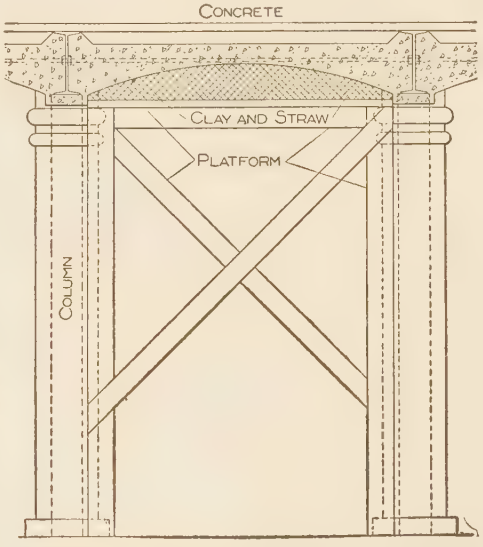
Fireproof Safe Made of Concrete can be Built at Home at Very Low Cost

About two sacks of cement are needed. If desired, the safe can be given a good black finish by mixing about 1½ lb. of lampblack with the cement.

It will be noted that the door slides up to open. The door can be latched open by means of a rod spanning the opening, moving freely in holes cored into the concrete. The end of such a rod is shown in the view of the completed safe, projecting from the side, near the top of the opening. For convenience in handling, the safe should be set on casters. Mold the sockets for the casters when pouring the concrete.

Clay Forms for Making Concrete Arches

Wood forms for making cement vaulted ceilings are very expensive, as the material for constructing them is so cut



A Form of Clay and Straw Built on a Platform for Making Concrete Arches

up that it cannot be used for other purposes. This caused contractors who had a series of vaulted ceilings to make to try out using a clay and straw mixture on which to place the cement. The idea proved a success and they made flat platforms on which the clay and straw were rounded up to shape the vaulted ceiling. The cement was mixed and placed on the clay forms. The accompanying sketch shows a section through the center of one arch. When the cement had set and the forms had been removed, the clinging clay was washed away with water from a hose.

Such forms could be used in many places where wood forms, on account of cost, are prohibitive.—Walter A. Weldon, Rochester, New York.

A Rural Mail-Box Post of Concrete

By A. J. R. CURTIS

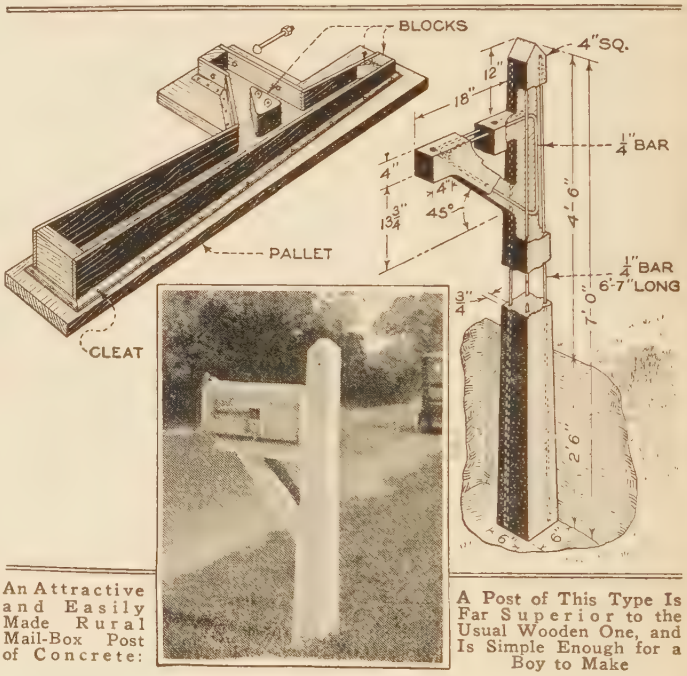
PROGRESSIVE farmers and villagers all over the country are discarding the old makeshift wooden mail-box post, and substituting for it the modern concrete post, which is attractive in appearance, and is neither affected by frost, attacked by rot, nor likely to be destroyed by fire.

Any farmer with a little time to spare can make the post described in this article at home. It is so simple in construction that it is suggested as an excellent manual-training exercise for rural-school students.

The accompanying drawings show how the post is constructed. The form is built up on a floor having a level and regular surface, or on a pallet or mat of boards, 8 ft. long and at least 30 in. wide. If a floor is used, a strip of building, or other heavy, paper should be used as a covering. The form consists simply of a few wooden strips (dressed on all surfaces to be touched by the concrete), held in position by cleats lightly nailed to the floor or pallet. The post is cast on its side. Prepare first two pieces of 1-in. board, 7 ft. 4 in. long, 6 in. wide at one end, and tapering to a width of 4 in. at the other. Finish and sandpaper the opposite faces of each. One of these strips serves as a form for the straight, plain side of the post. The other serves as a form for the opposite side of the post, being cut as required, and joined to smaller pieces, of similar material, to make the entire outline of the bracket and shelf. The form for the interior triangle is best made from a block with a small amount of taper, so that it can be withdrawn upward. This piece in particular must be well greased and sandpapered, and screw-eyes should be inserted in the top to make its removal easier.

The longitudinal strips are held apart by square blocks inserted between them at the lower and upper ends. Triangular blocks, inserted at the upper end, form the upper corners of the post, as shown in the perspective.

The reinforcing in the post consists of four ¼-in. round bars, 6 ft. 9 in. long, placed symmetrically at the four corners of the post, ¾ in. in from the surfaces. The bracket and shelf are reinforced with two triangles made of ¼-in. bars, bent as shown, and inserted in the mold one above the other, 1 in. away from all outer surfaces. The bolts to which the mail box is attached are placed through the molds before the concrete is deposited.



An Attractive and Easily Made Rural Mail-Box Post of Concrete:

A Post of This Type Is Far Superior to the Usual Wooden One, and Is Simple Enough for a Boy to Make

The concrete for the post is mixed in the proportions of 1 part Portland cement to 3 parts well-graded sand, under ¼ in. in size, or 1 part Portland cement to 2½ parts sand and 1 to 2 parts of crushed stone, or pebbles, from ¼ in. to ½ in. in size. The mixture must be made just wet enough to flow freely to all parts of the mold. The mold is well greased, before the concrete is poured, with any light grease, or heavy-bodied oil, such as linseed oil.

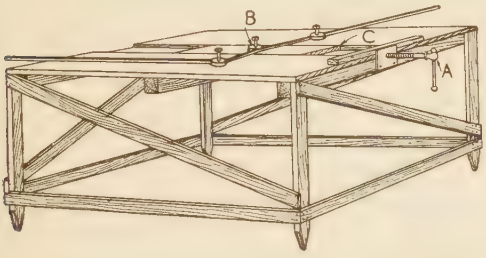
In moderate weather, allow the post to remain at least three days before attempting to raise or remove it. In cool weather, wait four or five days. At the end of that time move it only with great care, as posts that later become very strong and hard are easily injured by careless handling while "green."

As soon as the mold is removed, brush

and scrape off fins and other blemishes, and fill up holes and hollows with the same mixture as used in the post. Then paint the surfaces with a creamy mixture of cement and water, and store the post where it will not be exposed to sun, wind, or frost, or subject to strain.

To Bend Reinforcing Bars

A homemade bench for bending reinforcing bars, devised by a correspondent of Engineering and Contracting, is shown in the accompanying sketch. The bench proper is 30 in. high and 5 ft.



Homemade Bench with Sheaves and Sliding Parts to Bend Reinforcing Bars by the Pressure of a Screw

square. The bending device consists of two stationary sheaves and one movable sheave, B, mounted on a sliding strip, C, operated by a screw A. The bar is inserted between the sheaves as shown and by operating the screw A, the sheave B is moved so as to produce the bend. A scale on the slide C indicates the travel required to produce the same bend on each bar. The sheaves can be taken from old blocks. The stationary sheaves are spaced from 10 to 18 in. apart, the heavier bars, ⅞ in. in size, requiring an 18-in. spacing.

Moving a Cement Sidewalk

A contractor was called upon to move a cement walk that was 5 ft. wide and 62 ft. long. The first thing he did was to remove the dirt on one side to a point where the walk was to be placed, and a sand bed put in. Stakes were driven in the earth with their tops level with the lower edge of the walk. Some pieces of wood were laid on top of the stakes with their ends extending under the edge of the walk. Planks were placed on the other edge of the walk, against which a number of jackscrews were set. Each screw was set up a little at a time and the walk was easily moved all in one piece.

Gravel in Concrete Mixtures

Most bank-run gravels contain a great deal more sand than is desirable in a concrete mixture. Sometimes this sand is twice as great in quantity as would be best. If about 75 per cent of bank-run gravel were fine material, the proper proportion of cement would vary widely from that required in case only 30 per cent of the gravel were fine material. Only by separating the fine sand from the pebbles can definitely specified concrete mixtures be secured.

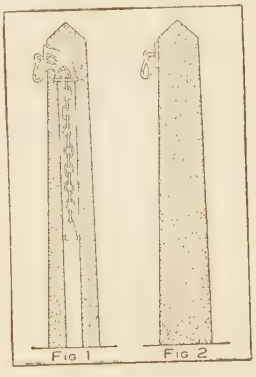
Mixture for Waterproofing Cement

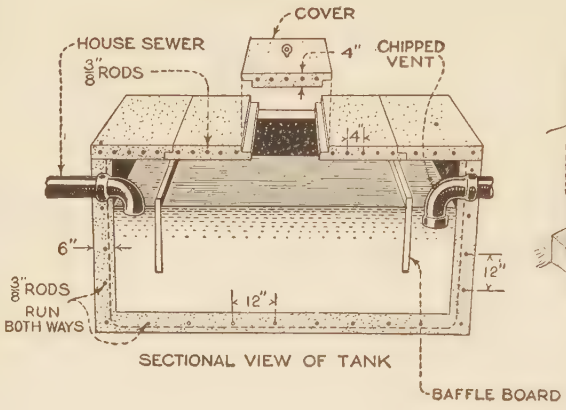
A formula that has been used quite generally and with satisfactory results for waterproofing cement is a solution of lye and alum. Five pounds of powdered alum and 1 lb. of lye are dissolved in 10 qt. of water. Use ½ pt. of this solution to each bucketful of water used in mixing the cement.

For outside waterproofing, add ½ pt. of this mixture to a bucket of water, and thicken with pure cement to the consistency of a heavy wash.

How to Make a Cement Hitching Post

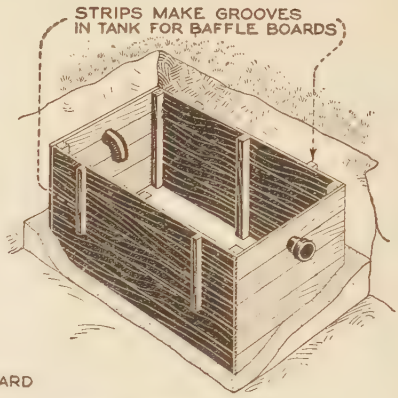
The cement post as illustrated by the accompanying sketch is made in a mold constructed of boards. The shape of the mold can be made to suit the builder. The post should be about 10 in. square at the bottom; 6 or 7 in. at the top. When the mold is ready for the cement a 1½-in. gas pipe with an elbow screwed on one end is placed in the center of the mold. A cement composed of 2 parts sharp, clean sand and 1 part cement is poured into the mold around the pipe. When the cement sets, the pipe should be in the center of the post, as shown in Fig. 1. A chain with a weight attached to one end and a snap on the other is placed in the pipe as shown. The ring holding the snap is made sufficiently large so it will not pass into the elbow. Figure 2 shows the completed post.



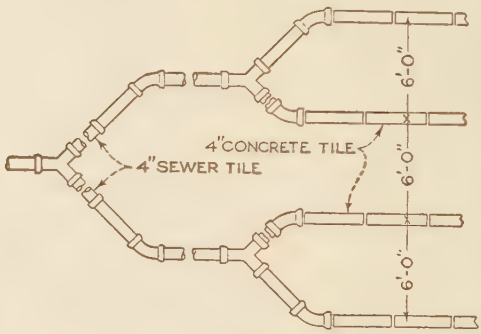


SECTIONAL VIEW OF TANK

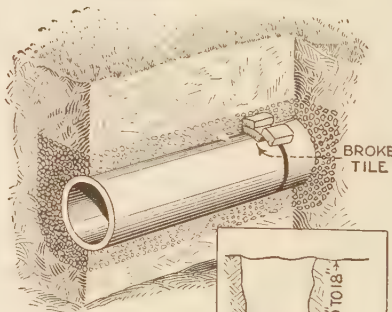
BAFFLE BOARD



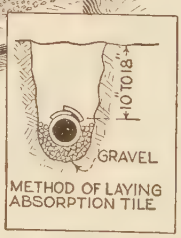
INNER FORM FOR TANK



PLAN OF DISTRIBUTION SYSTEM



TILE SURROUNDED BY STONE OR PEBBLES



METHOD OF LAYING ABSORPTION TILE

ARRANGEMENT OF SEPTIC TANK

A Septic Tank for Town or Country

By A. J. R. CURTIS

THE farmer and small-town dweller can easily obtain all the advantages of running water and bath, with perfect protection against contamination of water supply and filth diseases, by means of a septic tank. This method is the most satisfactory for the disposal of household and other wastes, where a regular sewer system is not available, and the ordinary septic-tank installation is not at all difficult to make.

Household wastes are carried from the house sewer or plumbing outlet directly to the tank, where the solid portions are converted into liquids and gases. The bacteria that cause this change are vigorous only in the absence of oxygen, so the tank chamber should be sealed to exclude air. The sewage should remain in the tank at least 24 hours. After leaving the tank, the liquid, in a semi-purified state, flows into a tile line, where an entirely different kind of bacteria, known as aerobies, which require air in order to live, attack the liquids and complete the process of purification.

DIMENSIONS OF SEPTIC TANKS				
NO. OF PERSONS	CAPACITY IN GAL.	WIDTH	LENGTH	LENGTH OF TILE IN FT
5	250	2'– 0"	4'– 0"	150 TO 250
10	500	3'– 0"	5'–4"	300 " 500
15	750	3'– 6"	6'–10"	450 " 750
20	1000	4'– 0"	8'– 0"	600 " 1000
25	1250	4'– 6"	9'– 0"	750 " 1250
ALL TANKS 5 FEET IN DEPTH				

Table Showing Dimensions of Septic Tanks for Various Sizes of Residences

The simplest form of septic tank, and one that gives successful results for small-residence use, is a plain, watertight, concrete tank set below ground. Its size will vary with the amount of sewage to be treated. The tank should be made so that a depth of not less than 4 ft. of liquid may be maintained, and any increase in capacity may be obtained by extending the length rather than the width. In this way the sewage has a longer path to travel before being discharged from the tank and the septic action is more thorough. The wastes should enter the tank at the lowest possible velocity, and for this reason the tank end of the house sewer should have very little pitch. A baffle board must be erected immediately in front of the sewer outlet to reduce the velocity of the flow still further. Likewise, the discharge of the treated sewage should be made with a minimum of disturbance to the contents of the tank. To allow this, the outlet must be provided with an air vent.

The concrete for the tank should be made of a mixture of 1 part of cement, 2 parts of sand, and 3 parts of pebbles or clean broken stone. The walls and floor should be 6 in. thick and reinforced with ¼-in. steel rods spaced 12 in. apart in both directions, or with heavy woven wire. The reinforcement should extend down the walls and across the bottom, forming a sort of basket. The cover should be not less than 4 in. in thickness and reinforced with ¼-in. rods spaced 4 in. apart. It should be made in slabs to make it easily removable for cleaning. In case the tank must be set at a considerable depth, with the weight of several feet of soil upon its top, the cover must be made thicker and stronger than this. A hollow extension to the surface of the ground, large enough to admit of cleaning when necessary, may also be found advisable.

The smallest size tank that is practical is one for a family of five persons, which upon the assumption that the daily sewage production is 50 gal. per person, should have a capacity of 250 gal., if the general practice of sewage retention for at least 24 hours is to be followed. In most cases septic action will begin practically as soon as sewage enters the tank but in rare cases it may be necessary to introduce a quantity of septicized sewage from some other tank. Once started, the action rarely ceases.

The forms for the tank are very simple; the inner form consists of a box, with holes bored in the ends to receive the sewer-pipe "ells" that form the inlet and outlet of the tank. Strips of wood are nailed to the sides at the points indicated, to form grooves in the inner walls for the reception of the baffle boards. Where the soil is self-supporting, an outer form may be dispensed with, and the earth itself used to support the concrete. Where the soil is loose, however, an outer form, consisting of a bottomless box, must be used. The lumber used for the forms should be clean, preferably surfaced, and the joints must be made tight to prevent leakage of the

concrete. A thorough wetting of the form before placing the cement will swell the wood and assist in making the joints tight. The forms should be greased or oiled before placing the concrete and the mixture must be well spaded in the forms to insure filling all corners.

Since the purifying action is only partly completed in the septic tank, the tile distribution system, in which the aerobic bacteria complete the process, is of almost equal importance to the tank. The liquids should never be allowed to pass directly from the tank into a pond or stream, neither should they be discharged directly into a sump or on the surface of the ground.

The disposal or distribution system should consist of a line or lines of 4-in. drain tile, preferably laid as indicated in the drawing, in order to get a maximum length of tile in a small area. If the septic tank is located near the residence, as is usually the case, the tile leading from this point to the disposal or absorption field should be laid as closely together as possible and sealed with cement mortar in the same manner as a sewer. In the absorption field, however, the tile are laid with open joints near the surface, where the soil carries an abundance of oxygen.

In mild climates 10 in. is sufficient depth for the distributing tile, this being increased to a maximum of 18 in. in colder regions. The open joints are protected by pieces of broken tile to prevent dirt from falling into them and clogging the line. Uniform absorption by the soil along the entire length of the distributing tile will be facilitated by laying the tile to an accurate grade with a fall of about 2 in. per 100 ft. Some authorities prefer a steeper grade at the beginning, changing gradually to a level grade at the end.

The length of the lines of tile will depend upon the amount of sewage discharged and upon the character of the soil. In sandy soils of an open texture which admit of an even absorption, good practice indicates that 3 ft. of tile should be laid for each 5 gal. of daily discharge. In tight, clayey soil this should be increased to 1 ft. or more for each gallon. In certain cases where thorough absorption seems difficult, it is well to surround the distributing tile with gravel, cinders, broken stone, or some other similar porous material.

A Lawn Roller Made from a Sewer Tile Filled with Concrete and a Mounting of Pipe

Easily Made Concrete Lawn Roller

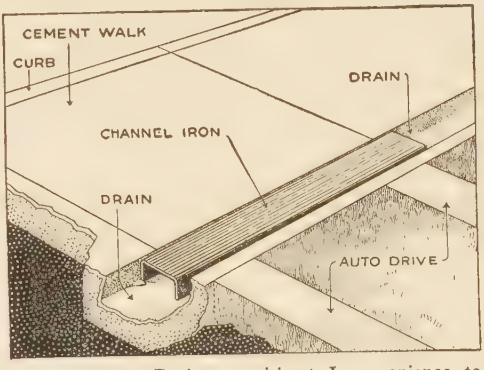
To keep the lawn in good condition, it is necessary to have a lawn roller. One can readily be made of concrete, as shown in the accompanying illustration. Get a drain tile, 2 ft. in diameter. If it has a bell or flared end, cut this off with a cold chisel and hammer. Set the tile on a wooden platform, so that the concrete can be poured in. Before pouring the concrete, a length of pipe should be placed in the center of the tile to serve as an axle, the centering being done by making a cross to fit over the open end of the tile, and cleats nailed to the ends of the cross-pieces to hold them in place securely. A hole drilled equidistantly from four points on the side of the tile, where the cross-pieces fit over it, will be in the exact center. A hole is also drilled in the wooden platform to receive the lower end of the pipe. With the pipe in place, pour in the concrete. After setting for a few days, the ends of the pipe axle are cut to suitable length and threaded for caps.

Concrete Bases for Steel Posts

The increasing scarcity and cost of wooden fence posts are gradually forcing the steel post into general use. It is well known that steel posts, when set in concrete, will stand firmer and last longer, but the common system of digging the post hole first, setting the post, and then filling the hole with concrete, is a slow and tedious job. I have found the following method much better: Make tubes 6 in. in diameter and 20 in. long from building paper; strengthen the splice by driving a few tacks through the double thickness of paper into a piece of lath placed on the outside. Drive the tacks from inside the tube. Place these tubes in rows on the ground, about a foot from the barn wall and slanting a little toward it. Then drop a little sand or loose dirt into each tube to prevent the concrete from running out at the bottom. Place the lower ends of the posts in the tubes, leaning the upper ends against the barn wall so that they will be approximately centered in the tubes, and fill the latter with concrete. The mixture should be in the proportion of 1 part of cement to 5 parts sand. After the tubes have been filled with the cement and sand mixture, they should be allowed to remain undisturbed until thoroughly dry. When ready for use, the posts and their concrete bases can be loaded onto a wagon, hauled to their destination, and firmly tamped into the holes dug for them. —Ed. Henderson, Lake Mills, Ia.

Cement-Sidewalk Drainage

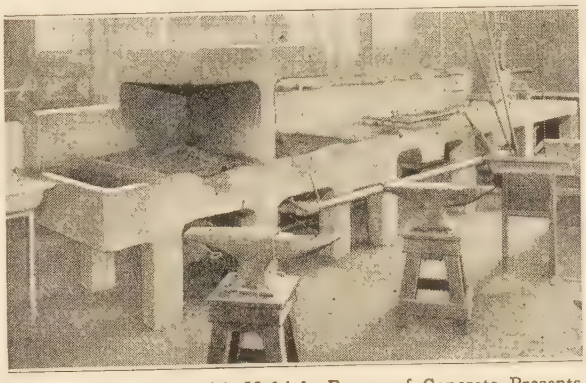
Proper drainage of cement sidewalks is a problem in many localities, as puddles of water, gathered on the cement, make bad walking in the rainy season. It has been found effective to form a cement drain channel, as illustrated, along the walk next to the property line, and to keep this channel clear of dirt so that the water can flow along it to a drain pipe. Where automobiles drive over the drain to reach a private driveway, a piece of channel steel of proper size should be inverted in the drain so that cars can drive over it without a jolt. The steel is not fastened down, and can be lifted readily to clean out dirt. It can be prevented from moving endwise by properly forming the cement.



Good Sidewalk Drainage, without Inconvenience to Passengers in the Automobile, is Provided by a Drain with a Channel-Iron Bridge across It

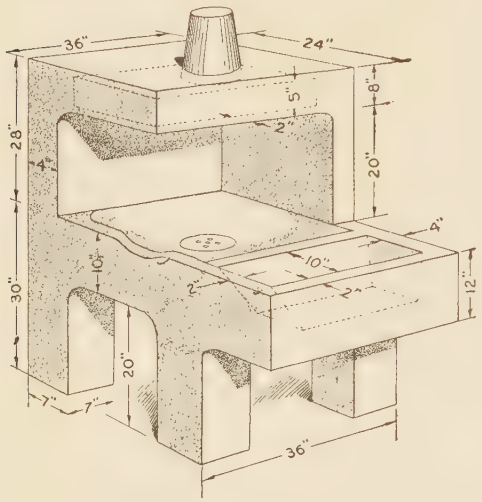
Forge of Concrete for Single or Multiple Use

One of the most recent uses of concrete is in the making of blacksmiths' forges. The multiple arrangement pictured has been in service for more than a year and has proved entirely satisfactory. A mixture of four parts gravel, two parts cement, and two of sand was used. The forms for the legs and hearth were built first. That for the hearth was built onto the leg forms, and the form for the hood was built onto the hearth form. The top of the forms of the hood and hearth was left open in each case to permit pouring and troweling. The center of the hearth is left about 4 in. lower than the edges.



The Shop Equipped with Multiple Forges of Concrete Presents an Appearance of Neatness Heretofore Unobtainable, and the Forges have Proved not Only Durable, But Very Convenient for the Operator

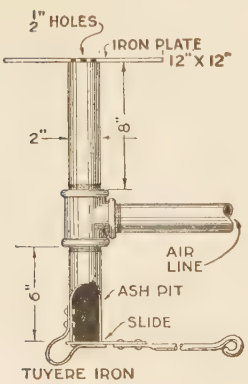
The form for the trough should be fastened together very lightly and held in position by several strips across the



Details of the Concrete Forge, Showing the Cooling Trough and Method of Installing the Flue Attachment

hearth form. A galvanized-iron bucket is set in the hood to form the base of the smokestack. The bottom of the bucket is removed after the pouring. A tuyère iron may be bought, or one made after the fashion of the iron shown in the sketch. Whatever type is used, it should be placed in position in the form and the concrete run around it after provision has been made for holding it in place.

After the form is all complete the iron reinforcement is put in place. This may be made from old scrap iron such as wagon tires or round rod. Care should be taken to see that the reinforcements connect properly. No provision need be made for expansion and contraction caused by heating and cooling. This is taken care of automatically.



¶Holes in concrete are ordinarily caused by air bubbles. These may be eliminated by stirring, after the concrete has been placed in the forms, with long iron rods.

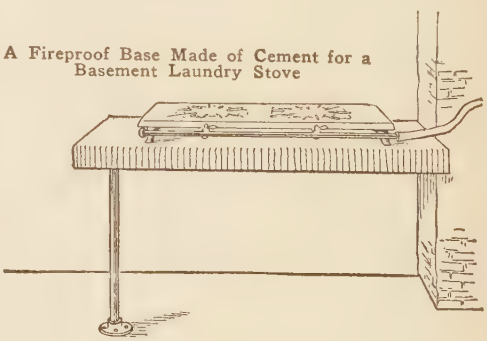
Concrete Haystack Platform

Most farms have at least one haystack outdoors the year round, and much of the hay is spoiled because the layer next the ground collects moisture and becomes soiled and moldy. By providing a circular base, or foundation, of concrete that slopes away from the center, most of this waste could be avoided. The base should be about 3 in. thick at the edges, and from 6 to 10 in. at the center, according to the diameter. A good underfilling of crushed stone, or cinders, should be provided before the concrete is placed. Expansion joints, which may be made of thin wood strips, should be provided from the center to the edge, dividing the base into segments.—J. H. Van Nice, Chicago, Illinois.

Fireproof Base for a Laundry Stove

To eliminate all danger of fire resulting from a laundry stove in the basement, I made a concrete base or shelf, as shown in the sketch. A form was made and set against the wall, the back being 6 in. lower than the front, with a border, 3 in. high, on the two outer sides. A hole was bored in the projecting corner large enough to admit a piece of 1-in. pipe, which was fitted with a floor flange on the bottom and set up in the hole, the top extending into the form about half as high as the edge. The wall and side of the chimney were cleaned and plastered with a rich mixture of cement to make it binding, then the form was filled to the top with cement. The form was removed after the setting of the cement, and it left a hard stone shelf firmly cemented to the wall with an iron leg in the

A Fireproof Base Made of Cement for a Basement Laundry Stove



outer corner fastened solidly in the cement. The shelf is 30 in. long by 24 in. deep, 3 in. thick in front, and 9 in. thick at the back.—L. M. Johnson, Emsworth, Pennsylvania.

Keep Cement Dry Until Ready for Use

It is very important that cement to be stored any length of time prior to use shall be protected from moisture. Sacks or bags which have become wet are unsuited to further use as cement containers and are therefore not accepted for redemption.

Cement should never—never—be piled on the ground, which always contains some moisture. An improvised floor will protect cement.

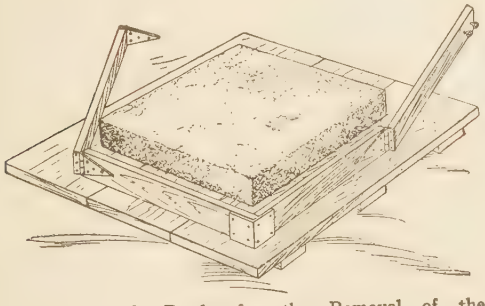
Any cement that has become wet is worthless, unless it is used at once before it begins to set.

If kept in storage for a considerable time, cement in sacks that were at the lower portion of piles is likely to become storage-caked from compression under the weight of the sacks above in the piles. A blow from a shovel will usually put such cement back to its previous condition. Lumps that may readily be crushed between the fingers are good. Any lumps which cannot be readily crushed are partly set from absorbed moisture, and should be rejected in order to insure the strength of the concrete to be made.

Form for Molding Concrete Slabs

A form for making concrete slabs that is easily made, convenient to handle, and constructed similar to a snap flask used by foundrymen, is shown in the accompanying sketch.

The form may be made in any size from ¾ or 1-in. lumber. Two of the sides are nailed or screwed securely together at right angles. The other two sides are hinged on the ends of these two joined sides as shown. When in position, the two hinged sides are locked



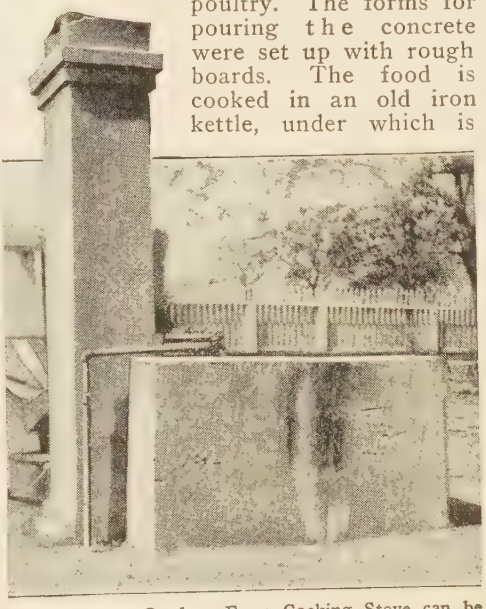
Form Opened, Ready for the Removal of the Concrete Slab

by means of a hinge and two screweyes, or a large hasp. The screws are put into the wood through the screw holes in the long wing of the hinge.

Paper may be placed between the concrete and the inner faces of the frame, or the frame may be greased instead. When the concrete is set, the screweyes are withdrawn, the frame opened, the two sides swung clear of the slab, and the frame pulled away from the other two sides of the slab.—James M. Kane, Doylestown, Pa.

A Farm Feed and Water Heater of Concrete

An ingenious farmer made a handy cooker for cooking feed for stock and poultry. The forms for pouring the concrete were set up with rough boards. The food is cooked in an old iron kettle, under which is



This Concrete Outdoor Farm Cooking Stove can be Made Handily with Simple Forms

provided a place for a fire, connecting with the chimney. The water is supplied by the pipe shown at the left. The device is thoroughly practical, and one that any farmer can build in spare time at small cost, as a permanent farm improvement.

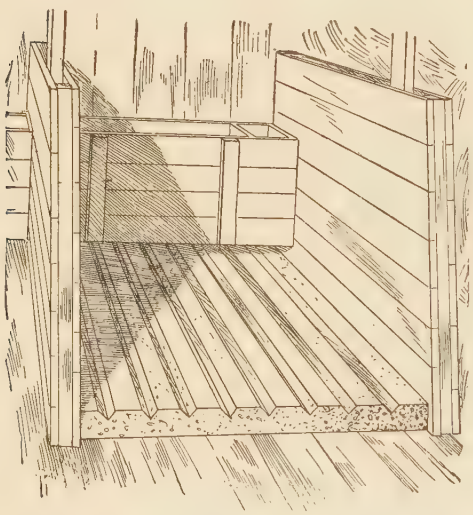
A Stiff Consistency Gives Maximum Strength

The stiffer the mixture, the less the quantity of mixing water, the lower the water-cement ratio and the stronger the concrete. Maximum strength of concrete is secured with a stiffer consistency and less mixing water than can be ordinarily used in construction work. Therefore, a safe rule is to use smallest possible quantity of mixing water, except in some products plants. Reinforced

concrete often requires a very plastic mixture; in such cases the strength-reducing effect of the excess water can only be offset by increasing the quantity of cement sufficiently to maintain the same water-cement ratio. In the manufacture of cement products the situation is reversed, because when the molds are removed at once the mix must not be too wet and care should be taken to insure that the mix contains enough water to secure the greatest strength.

Dry Concrete Floor for Stalls

The method of constructing concrete floors for barn stalls which is shown in the illustration will overcome the prejudice against this style of floor, as the channels will carry the water to the gutter easily and quickly, thus keeping the bedding perfectly dry at all times.



Concrete Floor for Barn Stall: The Channels Carry Off the Water to the Gutter

The floor is laid in the usual manner, with a proper slant toward the gutter. When finishing the top of the concrete, a straightedge is laid from gutter to manger and with the point of a trowel, grooves or channels are cut the entire length. These should be 3 in. apart and not over ½ in. deep. With such a depth there will be no danger that a sharp-shod animal might wrench a limb by catching the shoecalks in the grooves when turning around. This floor will give the animals greater comfort and save much labor in grooming them.—A. A. Houghton, Northville, Mich.

Finding the Contents of Concrete Walks

The contents of concrete walks and the amount of cement, sand, and gravel necessary to the cubic yard may be found by using the following rule: The width of the walk multiplied by its length, both measured in feet, equals the surface. The surface multiplied by the depth in inches and divided by 12, gives the total contents in cubic feet. The number of cubic feet divided by 27, equals the cubic yards of material in the body of the walk.

For example, find the surface and cubic contents of a walk 5 ft. wide, 100 ft. long, and 4 in. thick.

$5 \times 100 = 500$ sq. ft. of surface.
$500 \times 4 = 2000 \div 12 = 166\frac{2}{3}$ cu. ft. in the body of the walk.
$166\frac{2}{3}$ cu. ft. $\div$ 27 cu. ft. $= 6.17$ cu. yd. in the body of the walk.

The amount of the various materials may be ascertained by the following method. Add together the numbers indicating the proportions of the materials to be used in the mixture, and divide 40 by this sum. The quotient will equal the number of 100-lb. bags of cement needed for each cubic yard. The number of sacks of cement multiplied by the number of parts of sand and gravel will give the number of cubic feet of each per cubic yard.

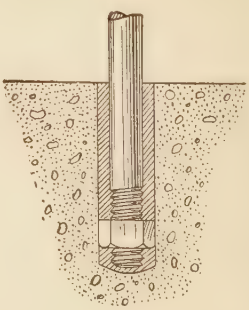
For example, the mixture is to be 1 part cement, 2 parts sand, and 4 parts gravel. The sum of these three is 7.

$40 \div 7 = 5.71$ bags of cement to each cu. yd.
5.71×2, proportion of sand $= 11.42$ cu. ft. of sand per cu. yd.
5.71×4, proportion of gravel $= 22.84$ cu. ft. of gravel per cu. yd.

—Geo. M. Petersen, Buffalo, N. Y.

Concrete-Floor Bolts for Machinery

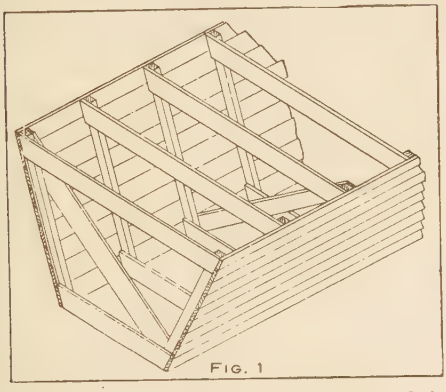
Make a hole in the concrete large enough to receive the nut of the bolt to be used. Place the bolt with the nut down in the hole and fill the space with melted babbitt.



By using this method a temporarily located machine may be taken away, as the bolts are easily removed, and the holes plugged, leaving no projections on the floor.—G. H. Holter, Jasper, Minnesota.

Cement and Concrete Lining of Ditches

A certain water company in southern California has lined its main canal and laterals with a thickness of concrete varying from 4 in. for the larger canal to 2 in. for the smaller laterals. The work of lining was done very thoroughly and with great care. If the canal was



Construction of Wooden Form for Lining Irrigation Ditches

of an old earth ditch it was prepared for the lining and carefully finished as described. If the canal had to be constructed and then lined, the excavation was made with shovels, and the excavation given an irrigation to settle and soften the ground. The excavated cross-section was made larger than the finished cross-section by the thickness of the lining, says the Irrigation Age. The bottom of the ditch was carefully graded and tamped so as to give a solid, smooth surface. A wooden form in the shape of a trough with no bottom is placed in the bottom of the ditch. This wooden form is 16 to 20 ft. long, depending on the size of the ditch, and to make it rigid the frames on which the side mold boards are nailed are placed every 2 ft. apart, as shown in Fig. 1. The trough is placed in such a position that the axis of the ditch coincides with the axis of the form. Moist earth from the excavation is shoveled behind this form and is well tamped in successive layers; at least 6 in. of earth is packed solidly in this manner, as shown in Fig. 2. The earth form is now removed and before the earth has had time to dry the lining is put in.

Another form, smaller than the earth form, is used for the lining. For use in some of the laterals this form was given a peculiar shape with the idea of strengthening the lining and giving the ditch a slightly curved form at the bottom, the corners being rounded as shown in Figs. 3 and 4. The form is built with the usual side slopes of ½ to 1; the slope is made flatter for the lower 8 in., where a slope of 1 to 1 is used. The depth of the form is equal to the depth of the lined section plus the thickness of the concrete. The form for larger canals is similar to the earth form. It is placed on the bottom of the finished earth ditch and properly aligned; the concrete, which is mixed rather wet, is now thrown in the space between the form and the earth and well tamped. The side lining having been completed, the form is removed and the bottom lining put in. Wherever possible the concrete is kept wet while setting, by allowing water to run into the ditch and retaining it with earth dams.

The concrete is made of 1 part cement to 7 parts of coarse gravel of varying sizes. The main canal which was lined has a bottom width of 5 ft., a depth of 4½ ft., and the thickness of the lining is 4 in. Some of the smaller laterals are 8 in. at the bottom and 18 in. deep, with a lining 2 in. thick.

Portland Cement Coupling for Pipe

Needing a coupling for ½-in. pipe, and not having one, I used Portland cement, making a thick putty and putting it on just as in wiping a solder joint. The same method can be used on burst pipes, and the cement will hold like a coupling. I also stopped a leak in a heater with a thin paste of cement.—Walter Weber, 643 W. 46th Street, Chicago, Ill.

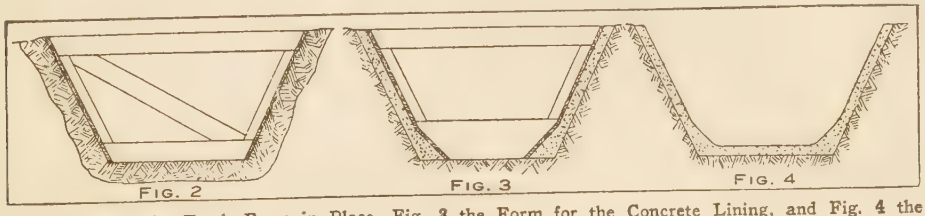
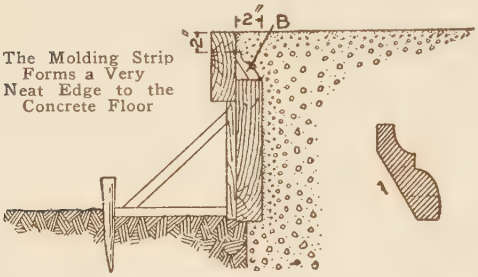


Fig. 2 Shows the Earth Form in Place, Fig. 3 the Form for the Concrete Lining, and Fig. 4 the Finished Lining

Molding a Neat Edge on a Concrete Porch Floor

The facing boards of the mold are built up as high as the porch is to be made, allowing an offset of 2 in., or the



The Molding Strip Forms a Very Neat Edge to the Concrete Floor

thickness of the first plank, as shown. The square corner formed by the offset in the boards is filled in with a portion of a crown mold, which is the idea of a correspondent of American Carpenter and Builder. The molding piece is prepared by ripping the piece on the line shown in the cross section A. The strip is then fitted in the offset, as shown at B.

First a neat cement is filled in against the form, then the coarser mixture placed on the inside.

Driving Nails in Cement

Cement would be used in many places, were it not for the difficulty of driving nails into it so that they will hold. If clean cinders are mixed with the sand and cement, the surface made with this material will hold a nail almost as solidly as if driven in wood. After giving this a thorough trial, I can recommend it for fence posts and nailing-places in basements.—Harry Fritzinger, Decatur, Indiana.

Heating Water for Cement

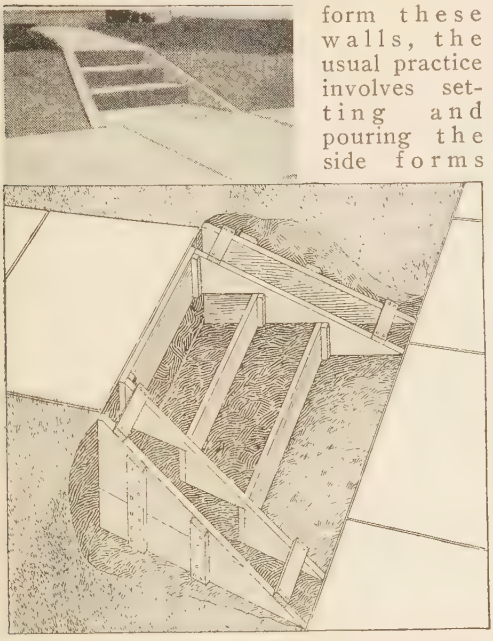
Having a quantity of cement left over from building a new house I concluded to build a creamery with it, and, as I had tried the old plan of heating irons in the fire and using them to heat the cement without much success, I devised the plan of heating the water in a coil attached to a barrel. This proved very satisfactory, as the temperature was below zero and the water had to be heated for the concrete. I set two barrels about 6 ft. apart, one elevated about 3 ft. above the other, and then bent three coils in a 16-ft. piece of ¾-in. pipe, putting one end in each barrel. This left the pipe on a slant between the barrels. A fire was built under the coil and cold water was poured into the elevated barrel. As the water ran through the coil it was heated and passed into the lower barrel hot and ready for use.

Two other methods may be used as shown in the accompanying sketch. The first one shown is two barrels on the same level, connected with a pipe and having a coil in the center attached to the bottoms of the barrels. A straight pipe is put in about one-third the way down from the top of the barrels. Water can be put in both barrels to a level just above the top pipe and the circulation will be free enough to heat the water quickly. The other method is to attach a pipe coil to one barrel as shown. This will cause a circulation free enough to heat the water rapidly.

Two Simple Methods of Heating Water in Barrels for Cold-Weather Concrete Work. The Material for the Apparatus can be Picked Up Anywhere

Timesaving Cement Forms

With the commonly practiced method of building cement steps for terraced lawns, retaining walls are usually built at the sides. To form these walls, the usual practice involves setting and pouring the side forms



A Concrete Form by Means of Which Steps and Sidewalls are Poured Simultaneously, Making Two Sets of Forms Unnecessary and Saving Considerable Time

first, removing them and placing the step forms after the cement has set.

Time can be saved by building the forms for the steps and sides and pouring them at one time, the forms being similar to the ones shown in the drawing. The outer sides of the forms extend down to the bottom of the wall; the inner ones are cut to the form and size of the steps, and are held in position by the boards that form the front face of each step, and by cleats, attached as shown. By this method, steps and walls are cast in one piece with a consequent saving in time.

Coloring Cement Work

Mineral colors only should be used for coloring concrete, as other colors are affected more or less by the cement and cannot be considered permanent. The color is only added to the material used in the surface, or finishing coat, to economize on material. The same proportion of materials should be adhered to religiously for each batch mixed, as otherwise the work will have a spotted appearance. The coloring pigments should be mixed with the cement before the aggregates are added. The cement should be spread out in a thin layer, the coloring material then sprinkled over the layer, and another layer of cement placed on top. The two layers of cement and the coloring should next be thoroughly mixed until no streaks remain. Coarse aggregate is then added and the mass again mixed thoroughly. Finally, water is added to the coat to give it the proper consistency. Dry coloring matter should not be sifted onto the surface of a freshly laid walk, or other work, as only a thin film is obtained which will rapidly wear off and leave the work spotty. In any case, not more than 10 lb. of coloring material should be added for each bag of cement, and, of course, the less coloring added, the lighter the tint will be.

Grays, blue-blacks, and blacks are obtained with lampblack, carbon black, and black oxide of manganese; various shades of blue can be obtained by using ultramarine blue, while colors ranging from brownish red to a dull brick red are the result of adding red oxide of iron; tints that run from a red sandstone to a purplish red are obtained with Indian red, and brown to reddish-brown tones are the result of metallic brown (oxide); buff, colonial tints, and yellows are obtained with yellow ochre. Green colors are produced by using chromium oxide.

Protecting the Edges of Concrete Curbing

The edges of concrete curbing may be protected against chipping by means of iron rods or tubing placed in position as

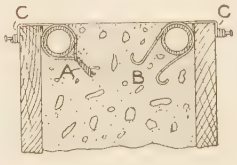


Fig. 1

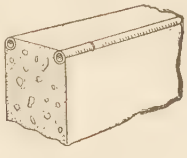


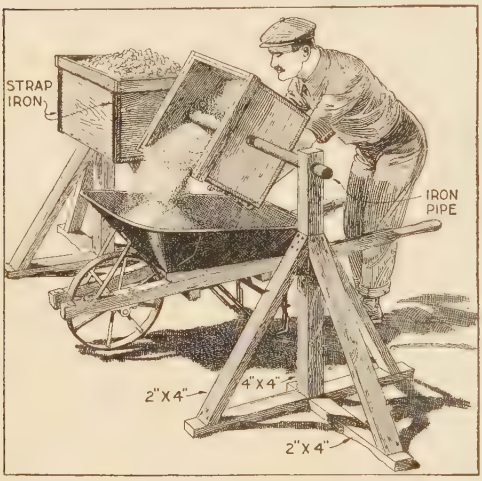
Fig. 2

The Edge of the Curb is Protected with a Piece of Pipe Anchored in the Concrete

shown in the sketch. The anchoring wires are shown in Fig. 1, A being the twisted type and B the hairpin anchor. The rods are held in the forms while the concrete is being poured with wires CC, which are cut close when the forms are removed. The finished curb is shown in Fig. 2.—James M. Kane, Doylestown, Pa.

Tip Boxes Measure Concrete Materials Economically

In the mixing of concrete, the materials should be measured accurately if the best results are to be obtained. Sometimes the wheelbarrow, in which the materials are carried to the mixer, is used for a measure. To insure accuracy in measuring the materials, and also a minimum of wasted time, the tip-measuring boxes shown in the sketch were made. The boxes are made with the desired cubic capacity, and hung above the center, on a 1½-in. iron-pipe axle. The boxes should be hung high enough to permit a wheelbarrow to be pushed under the bottom without interference. The supports are made of 2 by 4 and 4 by 4-in. pieces, strongly braced. The outfit may be dismantled quickly, and reassembled at another location, and the parts are of handy size for loading on a vehicle. In use, the shovelers fill the boxes, and the barrow men wheel their barrows under the boxes, which are promptly dumped. They are then filled again, ready for the return of the barrows.



The Measuring Boxes are Used in Batteries to Make Up a Properly Proportioned Batch at a Time

Several boxes are usually desirable. For example, if a concrete of 1 part cement, 2 of sand, and 4 of stone is to be mixed, and each batch comprises 10½ cu. ft. of dry material, there should be six tip boxes: one 1½-cu. ft. box for cement, two 1½-cu. ft. boxes for sand, and three 2-cu. ft. boxes for stone.

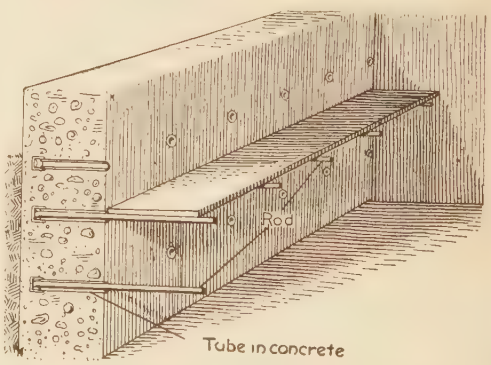
For each batch, the routine procedure of filling the battery of boxes, dumping their contents, and wheeling the material to the mixing trough is so simple that mistakes in proportioning the materials are not likely to occur.—Richard L. Nourse, Duluth, Minn.

Concrete-Form Oil

Concrete will not stick to forms that have been boiled each time before use with a mixture of boiled linseed oil and kerosene, in equal parts. If not so oiled, the forms should at least be carefully wetted down before the concrete is poured. Whitewash is frequently used for the same purpose, and makes an acceptable coating. If applied thin it will not stick to the concrete. If the forms are to be used again, they should be taken apart, and all adhering particles of cement carefully cleaned off.

Shelving Brackets for Cement Walls

When constructing a cellar or basement wall of concrete for a house or factory, place iron pipes horizontally in the forms in a row where shelves are wanted so their inside ends will be flush with the finished wall. The pipe should be ½ or ¾ in. in size, and of such a length as to not quite reach through the wall. It would be well to screw pipe caps on the ends placed in the concrete. The pipes should be placed close enough together in each row to keep the shelf boards from sagging. Fit each pipe with an iron rod of sufficient length to slide in the pipe and have enough projecting on which to lay the shelves. When the shelves are not needed, the iron rods can be pulled out, thus clearing the surface of the wall. Where concrete walls extend all the way up, this method can be used anywhere in the building.



Method of Making Removable Shelf Brackets for Concrete Walls by Inserting Pipes in the Forms and Using Iron Rods

Forms for Concrete Gateposts

The drawings illustrate two designs of concrete gateposts that can be made from easily constructed forms; the latter are put together on the job, and may be used repeatedly.

The style illustrated in Fig. 1 is about the simplest it is possible to build, but the severity of a plain post is relieved by the grooves, which are formed by cleats nailed to the four faces of the form. For either of these types, a footing is sunk 3½ ft. below grade, using alternate layers of field stone and concrete, mixed in the proportion of 1 part cement, 2 parts sand, and 4 parts crushed stone or gravel. Very heavy iron rods are imbedded in the footing with their ends projecting above the ground to serve as an anchorage for the posts. The face forms are made of ⅞-in. pine or spruce, and are crossed at intervals by ½-in. cleats of dressed pine. The front and back faces of the forms should lap the

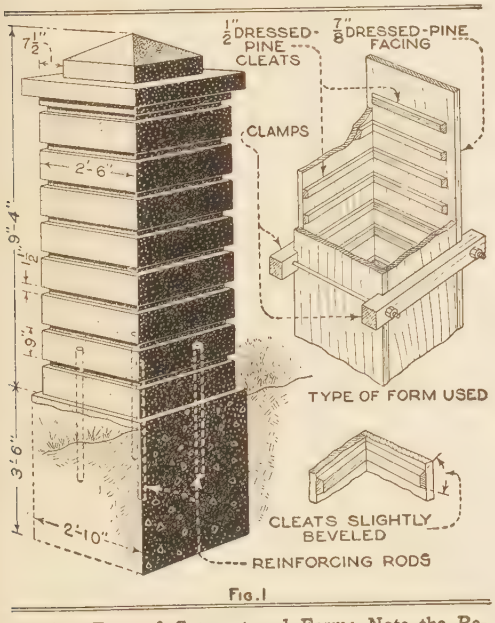


Fig. 1

Simplest Type of Gatepost and Form: Note the Reinforcing Rods Extending into the Footing and the Bevel on the Cleats

sides, and, when finished, the inside surfaces of all four pieces should be painted with dropblack, which, when dry, is coated with shellac. When set up, the forms should be held together by bolt clamps, spaced vertically at intervals of about 2 ft. The pyramidal tops of the posts are trowel-finished.

In general, the construction of the type illustrated in Fig. 2 is the same as the other except that it is paneled. If a light is desired, center the pipe or conduit, and allow plenty of the thread to project above the form, for attaching the lighting fixture, before the concrete mixture is poured. In all cases, the forms should be plumb, securely braced, and tight, so that no cement will run out with the water and leave unsightly voids.

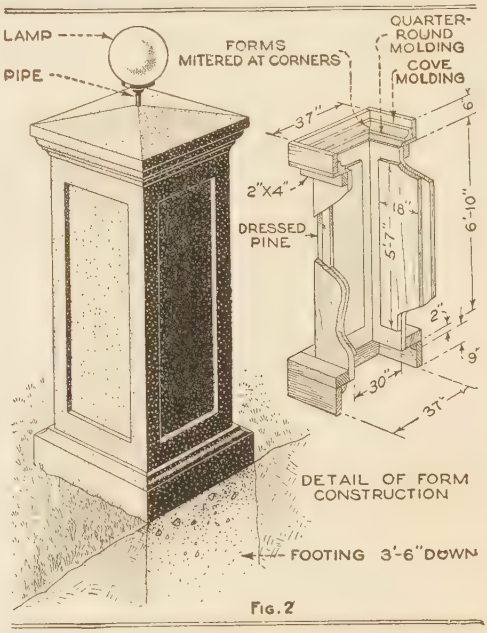


Fig. 2

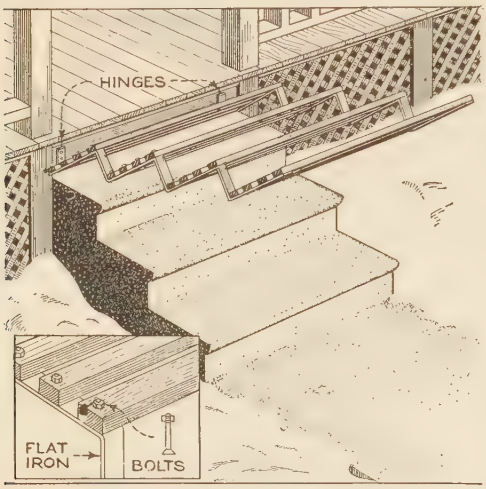
Form Construction for Paneled Type of Gatepost. The Pipe or Conduit for a Lamp may be Cast in Place and the Top Finished with the Trowel

The cement mixture used for both posts should consist of about 1 part cement, 2 parts sand, and 3 parts of fine aggregate, either in the form of crushed stone or gravel. By using white cement, white sand, and white stone or gravel, a practically pure-white effect is obtained instead of the usually objectionable tone of gray or brown. The concrete should be poured into the forms a little at a time, and should be thoroughly rammed so that it will come into contact with all parts of the mold and fill all corners completely. For convenience in removing the forms, the edges of the cleats and panels should be beveled slightly. The bevel shown on the cleats in Fig. 1 is exaggerated so as to illustrate it better.—James Tate, Chicago, Ill.

¶Sand that can easily be pulverized, that soils the hands, or smells, will not make good concrete.

Making Cement Steps Safe in Winter

Owing to the accumulation of ice on the surface of cement steps during winter, they not infrequently cause acci-



An Iron Frame, Provided with Wooden Treads, Eliminates the Danger Caused by Ice Accumulating on the Surface of Concrete Steps; It is Easily Raised for Cleaning the Steps

dents. The danger can be eliminated, to a large extent, by covering the steps with a frame, as shown in the illustration.

Two lengths of flat iron are bent to conform to the shape of the steps, and 1 by 1½-in. wooden strips are bolted across them, as shown. The strips are spaced about ¾ in. apart. Hinges are screwed to the riser of the upper step on the porch, so that the whole frame can be swung up when it is necessary to clean the steps. The hinges should have loose pins, so that the frame can be detached entirely when the winter is past.

Tamper Made of Concrete

A tamper for use in the garden or in home concrete construction may be made as follows: Procure a tomato can, about 4½ in. in diameter, and remove the top. Drive nails part way into the end of a broomstick, or other round wooden rod, so as to form radiating projections. Insert the broomstick with the nails in it into the can and pour concrete around it. Care should be taken that the handle fits in the center of the can, and that its lower end does not touch the bottom while the concrete is being poured into place. Permit the mixture to harden, and a tamper that will be substantial will result.—W. W. Baldwin, Washington, District of Columbia.

Facing Mixtures for Concrete Work

Many workers in concrete are more or less of the impression that the familiar, and frequently hideous, gray surface left by the forms is the only effect obtainable. However, a surface almost identical in appearance with granite or other pleasing stonework may be produced in a simple and inexpensive manner. This is accomplished by using a thin facing of cement mixed with small crystals of crushed quartz, or similar materials of different colors.

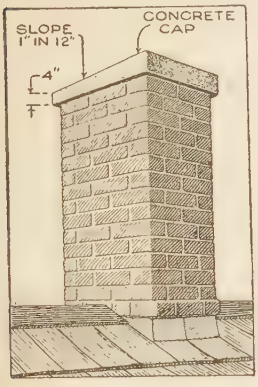
If the section is thin, say up to 4 in., it generally would not be too expensive to cast it entirely of the facing concrete, which is composed of 1 part of white cement to 2 parts of the crushed quartz. However, if the portion to be poured is more than 4 in., so that the expense of using the quartz particles for the entire thickness would be too great, a thickness of about 1½ in. of the finer materials will be found sufficient, and a less expensive and coarser mixture can be used for the rest of the piece. This is accomplished by placing a piece of expanded metal, of the smallest available mesh, inside the forms and about 1½ in. from the face. The facing mixture, prepared as previously explained, is then poured into this small outside space until it has piled up about a foot deep, when it is rammed down well with a rod. As the mixture begins to run through the expanded metal, the common concrete mixture, composed of the usual materials, is poured into the space between the expanded metal and the back of the form, until it has piled up to a point several inches below the facing mixture.

It is very important that the front, or facing concrete, be always kept at a greater height than the backing concrete while the pouring is being done, so as to prevent any of the latter from running forward and getting into the front part of the mold, thus spoiling the effect. Also, the facing mixture should be mixed "dry," so that it will not flow too easily. A dry mix is one that uses just enough water to hydrate the cement.

A variety of finishes is possible. The form may be stripped while the concrete is still "green" or incompletely hardened, and the surface wire-brushed so as to show the quartz and produce a rough effect, or it may be ground down until absolutely smooth, when it will take the appearance of polished granite. Still another method is to bush-hammer it in parallel rows.

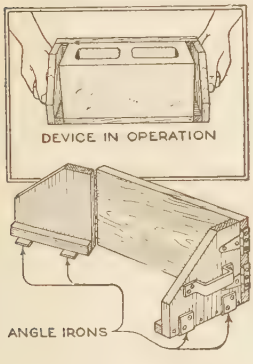
Chimney Cap of Concrete

The life of many a chimney would be greatly lengthened if a concrete cap was made for it when built. The cap holds the chimney in alinement, prevents the top bricks from becoming loose, acts as a watershed, and the chimney looks much neater than if no cap is used. Such a cap will add years to the life of an old chimney, but any loose bricks at the top of the chimney must be carefully cleaned and set in fresh mortar before the concrete is put on. The concrete cap should taper 1 in. to the foot, the concrete being 4 in. thick at the thinner edge. The cap should be made by tamping a rather dry mixture—1 part cement, and 4 parts sand—into a form made the proper size for the chimney. When dry it is set on the brick with ordinary mortar.



Carrier for Green Cement Blocks

For removing green concrete blocks from the molding machine to the curing room, the device shown in the drawing is used by one manufacturer to reduce damage to the soft blocks. The carrier consists of a three-sided box, both ends being hinged to the back. A wooden strip along the inside bottom edge of each end is provided for attaching the angle irons, as indicated. A handle, for carrying, is attached to each of the hinged end-pieces. In using the carrier, the ends are swung back and closed upon the moldboard on which the block is resting, so that it is supported on the projecting ends of the angle irons. Swinging back the ends releases the block.—Dale R. Van Horn, Lincoln, Neb.



Mixing Concrete in Winter

The aggregate, such as sand, pebbles, or broken stone, must be free from frost; if this is present in the materials they should be thawed before using.

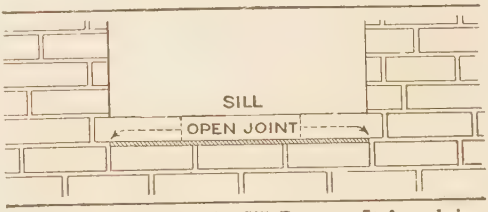
All materials entering into the mixture should be heated, so that the concrete, when placed, will have a temperature of from 75° to 80° F. It should be run into the forms immediately to prevent loss of heat.

Metal forms and reinforcing should be raised to the temperature of the concrete before this is poured, metal forms being heated with hot water, or by turning a jet of steam against them.

Protect the concrete immediately after pouring, to retain as much of the heat as possible. A layer of hay or straw will furnish the proper protection for some work. When the work can be inclosed, coke-burning firepots may be used.

To Prevent Cracks under Window Sills in Cement-Block Buildings

In erecting buildings of cement blocks, the blocks under window sills frequently crack. This is because proper provision for settlement has not been made, says Municipal Engineering. In most cases the trouble is probably due to the settling of the sills in the full bed of mortar when they are first set. To prevent the cracking, in either brick or concrete construction, set the sills at first with the joint full of mortar only at the ends, leaving a space under the sill for the whole width of the window space. The settlement of the wall can then occur during the construction without bringing the breaking strain upon the sills. After the work is completed and the settlement is presumably all done, fill the open joints under the sills with mortar and thus finish the wall. No cracks will then appear in either blocks, bricks, wall or sills under ordinary circumstances, and unless there is a great settlement, such as would come from insufficient foundation and bad design.



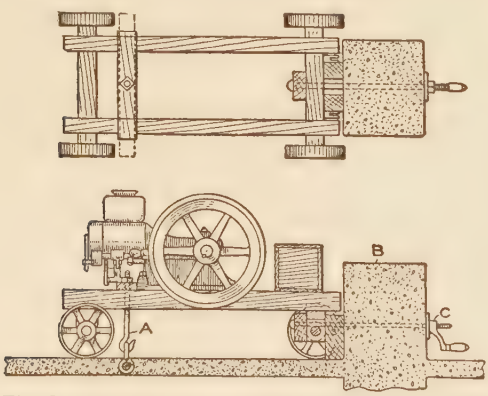
An Open Joint under the Sill Prevents It from being Broken When the Walls Settle

Easy Method of Riddling Sand

Riddling sand or gravel for use in making mortar, and other binders, is a tiresome task when the ordinary hand sieve must be used. A good way of lightening the work is to use a rectangular sieve, provided with handles on one end. Nail two strips, about 1 in. square, across the top of the box into which the sand is to be riddled, leaving space enough between them for a roller slightly larger in diameter than the thickness of the strips. By placing such a roller between the strips and drawing the sieve back and forth upon it, the necessity of lifting the sand while riddling it is avoided, and much labor saved.—Charles Darlington, Des Moines, Ia.

Solid Foundation for a Portable Engine

Varied service demanded of a gasoline engine required that it be mounted upon a truck so that it could be readily transported. This arrangement did not, however, render the engine stable enough for very heavy duty in a shop, and the concrete foundation and clamping device shown was arranged to secure the truck. The truck is drawn against the block B, and clamped by the hook and eye at A. The eye is fixed in the floor and swings on a rod imbedded in the concrete. The

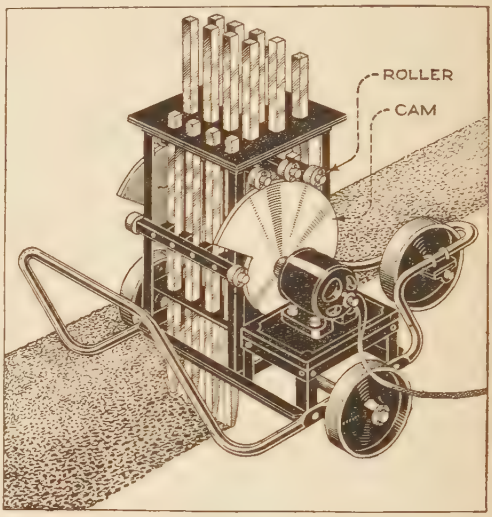


The Portable Engine is Clamped Securely to the Concrete Foundation and Is Stable under Heavy Strain

hook A is fastened by means of a nut at its upper end. The axle of the truck nearest the block B is clamped behind a pivoted wooden block, which is drawn up securely by the threaded bolt and crank C. If properly adjusted, this arrangement holds the engine firmly enough for heavy duty and long belt connection to the driving pulley.—B. Hanson, Martin, Ohio.

Roughening Smooth Concrete Surface

A large manufacturing concern found it necessary to replace a layer of several inches of asphalt on its receiving plat-



Smooth Concrete Surfaces can be Roughened by This Machine, Which is Operated by One Man, and Virtually Does the Work of Thirty-Two

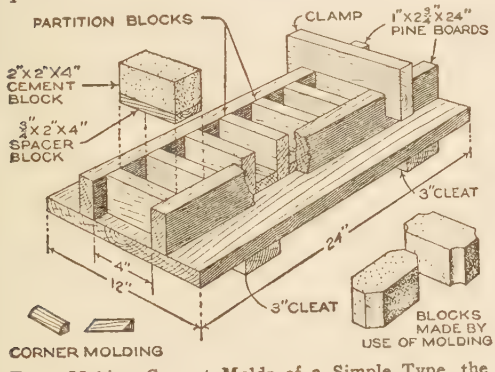
form with reinforced concrete, because the asphalt hampered trucking operations. Upon removing the asphalt, the constructing engineer found a perfectly smooth base. It was not advisable to lay the new floor upon this, as the two would not bond perfectly, and therefore several men were employed to roughen the surface. This was a slow process, however, and, as time was an important factor in the case, the engineer designed the machine shown in the illustration, that was operated by one man and virtually accomplished the work of thirty-two. The machine was built, in a few days, from materials found around the plant.

Sixteen crowbars, vertically arranged in sets of four, are fitted into square openings cut in the top and bottom plates of the machine, and are fastened at the center to square crossbars that carry a roller at each end. These rollers run on the surfaces of the two cams shown, which are carried on a shaft running between the sets of crowbars, and are driven at a suitable speed by a 1-hp. electric motor. As the cams revolve, they lift and drop the crowbars automatically. The bars are sharpened at their lower ends, and, as the machine is pushed over the concrete surface, they chip it deeply enough to make a good bond with the new surface layer.—R. V. Hurr, Chicago, Ill.

Making Toy Blocks of Cement

Cement molding, as a hobby, gives very wide scope for individual taste and ingenuity, so that its fascination continues to grow as the worker develops proficiency. There is not much difficulty in preparing the cement, but a good deal of care is needed in making and fitting the molds.

Begin by making a baseboard, of white pine or poplar. The dimensions given in the sketch will do very well. The board should be planed and sandpapered smooth on the upper surface, and two cleats screwed to the lower surface, as shown, making the holes in the cleats large enough to permit the screws to fit loosely. The cleats will prevent the baseboard from warping. Then prepare the sides of the mold. For blocks 2 by 2 by 4 in., which will be a useful size to the youngster, cut two long pieces for the sides of the mold; seven shorter ones, to serve as the partitions, and six spacers, to keep the partition blocks the proper distance apart. The molds can be fastened together with clamps, a good type for the purpose being shown at one end of the board. Two of these are sufficient, one at each end. Different sizes of blocks can then be made, merely by using spacers of different width and thickness. Variety can be given to the shape of the molds by placing triangular or quarter-round pieces in each corner, of



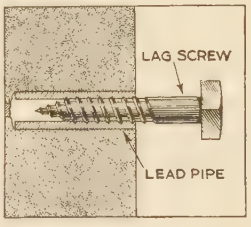
From Making Cement Molds of a Simple Type, the Beginner Soon Progresses to Designs of Real Decorative Value

the kind shown at the bottom of the sketch to the left. The pattern of these inserts can, of course, be modified according to the taste of the workman, but even the simpler kind will relieve plain blocks of their monotony, as shown at the lower right-hand corner of the sketch. Nothing more is necessary except a coating of paraffin or shellac, to be laid on all parts of the board that will come in contact with the cement, so as to prevent it from sticking. Paraffin is preferable; if shellac is used, be careful to see that it is thoroughly dry before filling the molds.

Make the mixture of sea-beach, or creek sand, and cement, using one part of cement to two parts of sand. Add water enough to make a thick paste. If a reddish tone is desired, add ground-brick dust to the mixture, using one part of brick dust to two parts of cement and sand. When the material is in the molds, smooth the surface with a wet knife. Ornamental faces can be given to the blocks by pressing upon the top of the mixture while it is still soft, a butter-pat mold, a scallop shell, or anything that will leave a clear impression. A more varied outline can be given to the blocks when the workman has become familiar with the materials. Let the blocks dry for several days before removing them from the molds. Trim the edges slightly with an old file to remove the fur. The blocks will then be almost indestructible.

Securing Lag Screws in Cement or Brick

The practice of securing lag screws in brick or concrete work by means of a wooden plug driven into a hole drilled in the wall is usually unsatisfactory, owing to the tendency of the wood to shrink and drop out. A more satisfactory method is to drill the hole in the usual manner, and then drive in a section of lead pipe having an internal diameter smaller than the lag screw used. When the lag screw is screwed into such a lead-bushed hole, the lead is expanded against the uneven surface of the brick or concrete, and grips firmly, making a permanent fastening.



How to Remove Stains from Concrete Floor

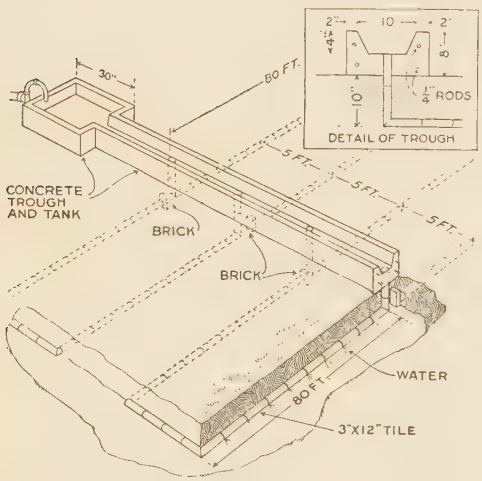
Oil stains on concrete floors may be removed by using a mixture of 1 lb. oxalic acid in 3 gal. water, with enough wheat flour added to make a paste that can be applied with a brush. Allow the application to remain for two days and then remove with clear water and a scrubbing brush. A second application will remove the most stubborn stain.

Moist-Curing Concrete

All concrete work exposing a large surface to the air should be kept moist by some such protective covering as burlap or canvas, to prevent too rapid drying through the action of sun and wind. The covering should be moistened, by frequent sprinkling, until the concrete has attained the desired hardness.

Subirrigation Eliminates Ditches

To supply moisture to their gardens and lawns, two neighboring families joined to install an interesting subirrigating system. A reinforced-concrete tank

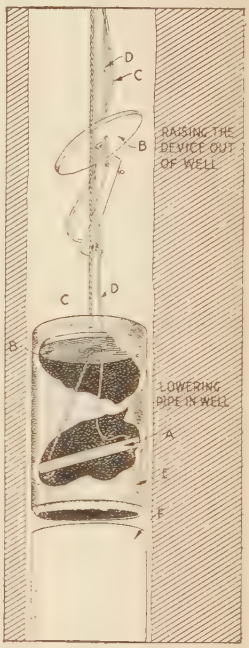


An Irrigating System, of Interesting Design, Which Furnishes Moisture to Adjoining Residence Properties, without Unsightly Ditches

and trough were built on the joint property line. From the trough, tile conduits are led off at 5-ft. intervals, as shown in the drawing. Each outlet in the trough is provided with a stopper, by which the flow of water, as well as the area to be moistened, is controlled. Water is supplied to the tank at the rate of 110 gal. per minute by a 2-in. centrifugal pump. The conduits are made of 3 by 12-in. drain tile laid about 10 in. underground. The ends of the tiles are not fitted closely together, and consequently water escapes at every joint. The ends of the conduit are stopped with bricks. Each of the lots on which this system is installed is 80 ft. wide, which requires a continuous tile conduit 165 ft. long for each outlet. Both lots cover a little more than an acre, which in two hours is saturated enough to show moisture on the surface.—Arthur Marquardt, Garfield, Kan.

Lowering Concrete Pipes into a Well

In replacing a wooden well casing with concrete pipes, 30 in. in diameter, and weighing over 700 lbs., the device shown in the sketch was used. The pipes were lowered from a windlass stationed over the well. A piece of 2 by 4-in. stuff, A, was cut slightly longer than the inside diameter of the pipe. A heavy rope was fixed to one end of it, and a lighter rope to the other. A cover, B, was fitted to the pipe and a hole bored at its middle, and the heavy rope passed through it. The smaller rope was passed through a hole adjoining. The board A was wedged into place in the pipe, at the top of the well. The cover B was set in position, with the ropes as shown. The heavy rope was fixed to the windlass. The pipe E was lowered into place, on the pipe F, and the rope D drawn up, releasing the piece A and the cover, which were drawn up for the next pipe.—Arthur E. Shaw, Columbus, S. C.



Size of Aggregates in Concrete

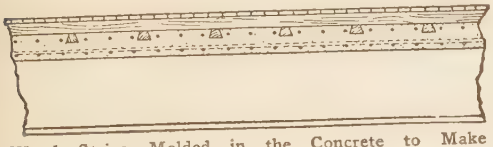
There is a general rule, in concrete construction, that no aggregate (pebbles or broken stones) should exceed in size one-half the wall thickness in which it is to be used.

However, 1½ in. is fixed as the maximum for most work, while in thin walls, where reinforcing must be surrounded perfectly, it is often advisable to use a smaller size. In the case of fence posts, the limit of size is usually ¾ in., as the space to be filled in with concrete is small. For much foundation work it is permissible to exceed the 1½-in. maximum, but even in this, it should seldom be over 2 in., except in the case of very massive foundations or footings.

Wood Top on a Concrete Floor

The accompanying sketch shows a concrete floor designed for use in a yarn mill. The problem was to provide a floor, resting on concrete, to which machinery could be easily and securely attached, says a correspondent of Industrial Engineering.

Planed, dovetailed nailing strips, or sleepers, 2 by 3 in., were accurately set with centers 18 in. apart, and concrete was poured around them, so as to completely fill the space beneath, and lock them into the mass of the slab. The illustration shows the sleepers and one system of reinforcing bars in cross section, and also shows how the sleepers were placed, without interfering with the

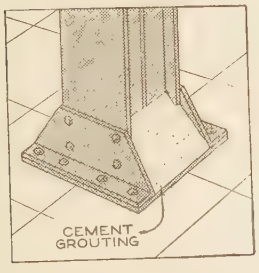


Wood Strips Molded in the Concrete to Make Holders for the Flooring Nails

reinforcing scheme, parallel to the bars of the upper course, and with three bars to each space between sleepers. The ends of the bars were butted halfway between the sleepers, and they were even nailed thereto with two 4-in. nails at each bearing. On top of the planking, and at right angles to it, was laid a floor of 7/8-in. square-edged maple. Machines can be readily and firmly attached to this floor by lag screws. It has a degree of elasticity not possessed by concrete, and is much more comfortable for the workers.

Dirt-Collecting Corners Filled with Cement Grouting

Column footings and similar corners in a factory were filled with cement grouting, as shown, overcoming the unsightly dirt accumulations. The floor may be washed with water from a hose, in many instances, and the fire risk from inflammable materials collecting in corners is reduced, and sanitation promoted.—Roy H. Poston, Flat River, Mo.



Setting Bolts in Rock and Concrete

To secure iron bolts in rock or concrete, sulphur is the cheapest material and one of the best, but unless certain precautions are observed, the results will be unsatisfactory.

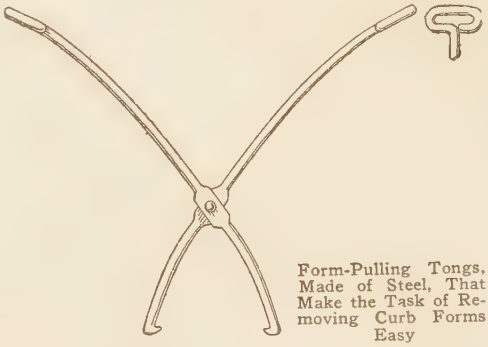
Drill a hole for the bolt with a star drill of the same diameter as that of the bolt head. For bolts larger than 3/8 in., the hole should be at least 3 in. deep. Dry out the hole by means of a gasoline torch, or by dropping a hot bolt into it.

The sulphur should be heated slowly in a melting pot. If it should catch fire, smother it. Sulphur melts at about 246° F., and at this temperature is a thin liquid, but when heated to about 320° it becomes very thick, making it hard to pour from the ladle. Therefore, the sulphur should be heated until it is all melted, when it will be quite thick. Remove the pot from the fire and allow the sulphur to cool until it becomes thin enough to pour into the hole into which the bolt has already been placed.

To fasten bolts in a concrete ceiling, where sulphur cannot be used, a thick paste of litharge and glycerin is used.—Ben Buck, San Francisco, Calif.

Tongs for Pulling Concrete Forms

Quite often when pulling out forms used in making "goose-neck" curbs, the edges of the concrete are broken off by the crowbar in lifting them. The tongs shown in the illustration will avoid this trouble and will make the task much



Form-Pulling Tongs, Made of Steel, That Make the Task of Removing Curb Forms Easy

easier. The tongs are constructed of two pieces of 1/2-in. steel, each about 14 or 15 in. long. The tongs are made on the same principle as ice tongs, but of a different shape. Two pairs of these tongs are necessary when the long rear or front boards are pulled out.

Concrete Wall Adds to Warmth of House

In seeking to modernize a dwelling by giving it the appearance of having a high foundation, the owner tried the experiment of applying a 2-in. thickness of solid cement directly over the original foundation and siding. In this way the cost of the improvement was kept at a lower figure than would have been the case had the house been raised and the foundation made higher.

Building a Low Cement Wall around a House to Improve Its Appearance: The Owner has Found That the Floors of the Dwelling Are Now Much Warmer in Winter Than Formerly

The main precaution taken was to see that there was a firm bond between the foundation and the wooden siding. At first glance it might seem that water would drip down between the concrete and siding, thus starting rot and giving frost a chance to open up cracks. Nails were driven into the siding at the corners of 6-in. squares, with their heads protruding, up to the height of the projected auxiliary wall. The concrete foundation was thoroughly cleaned and given a thin wash of pure cement. Then the forms were made and the concrete poured. A mixture of one part cement to two parts sand was used. The top of the wall fitted underneath the edge of one of the siding boards and was finished by increasing the thickness to 3 in. and sloping it slightly away from the house to run off the water; the corners were reinforced with wire mesh. After the concrete had set for about 24 hours, the forms were removed, and the surface marked off in imitation of brickwork, the lines being cut by running the point of a spike along a straightedge.

Finishing Concrete Pavements

Floors such as feeding floors and barnyard pavements should be finished with a wood float instead of a trowel. This will produce an even but sufficiently rough surface for a nonslippery floor.

"Dusting" Concrete Floors

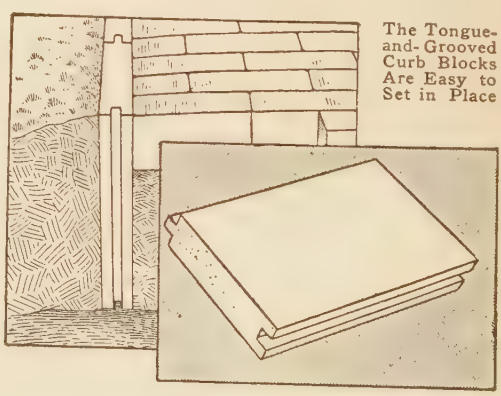
Concrete floors that become dusty under heavy use can easily be renovated by the application of some material that will bind the particles together to prevent the formation of dust. Among such materials are boiled linseed oil and water glass (sodium silicate); these are applied to the dusting surface with a long-handled whitewash brush.

In the linseed-oil treatment the oil is applied "straight." It penetrates the concrete and acts as a binder. While it darkens the color of the concrete, it also prevents, in large degree, the absorption of moisture.

In the water-glass treatment, the floor must first be thoroughly scrubbed with clean water. The surface is then allowed to become perfectly dry, and is next coated with a mixture of one part water glass, 40° Baumé, to three or four parts of water. The more porous the concrete the less water should be used. This preparation is swabbed over the concrete surface with a mop, and the floor then is permitted to dry. The surface is again mopped with clean water, and allowed to become thoroughly dry, after which a second and third coat of the water-glass solution are applied. The water glass on the surface is easily washed off, while that which penetrates the surface hardens into an insoluble binder.—James Tate, Chicago, Ill.

Curb Blocks for Road Pavements

In making paved roadways in the country, and especially in sandy soil, there is no necessity for having a curb with a gutter. The curb should be merely a support for the paving edges or blocks and a protection against damage by the vehicle wheels. One municipality, where

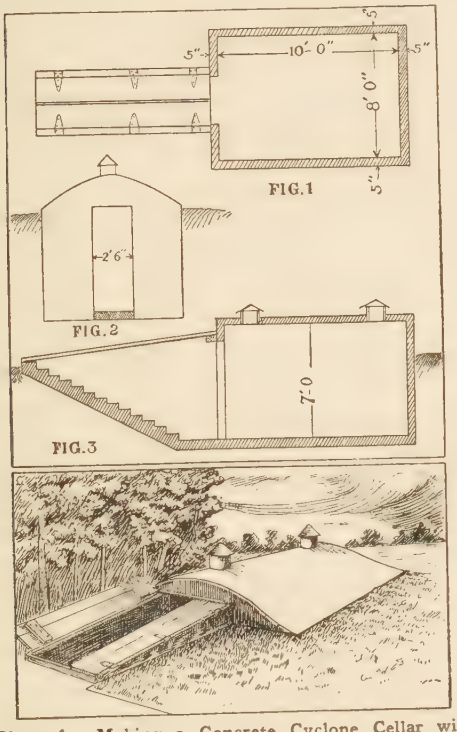


The Tongue-and-Grooved Curb Blocks Are Easy to Set in Place

it was necessary to build a paved roadway in sandy soil, used an interlocking curb block that was tongued and grooved, the blocks being about 24 in. long, 18 in. deep, and 4 in. wide, made of concrete. These blocks were set in the soil on the curb line so that their upper edges were level with the tops of the paving blocks. The shape of the block and the manner in which it is placed in the earth are clearly shown in the illustration.

A Concrete Cyclone Cellar

Many farmers on the western plains have cyclone cellars. When boards and timbers are used to construct the walls the wood will rot out in a few years and have to be renewed, says Concrete Re-



Plans for Making a Concrete Cyclone Cellar with Integral Steps and Roof

view. The accompanying illustration shows a cellar whose walls and roof are built of concrete. The walls are 5 in. thick and can be made by digging the hole sufficiently large to construct falsework and leave an open space of 5 in. for the concrete. The roof is arched and the concrete can be put on falsework to the proper thickness and smoothed over on the outside with a trowel. Tile with metal coverings over one end are fitted in the top of the arch for vents. Fig. 1 shows the plan of the cellar with proper dimensions, Fig. 2 the doorway, and Fig. 3 a cross section through the center. There is no danger of the roof blowing away or being caved in with a piece of flying timber.

Inexpensive Concrete Culvert Forms

A new method of constructing concrete road culverts was devised by the commissioners of a township in Lee county, Illinois, using empty salt barrels for forms. A ditch is first dug 1 ft. wider and 18 in. deeper than the diameter of the salt barrel, and at either end of the trench an excavation is made, about 1 ft. wide and 1 ft. deeper than the culvert trench, and overlapping the culvert bore about 10 in. on either side. The concrete is filled into the excavations at the end, and a bed of concrete, 6 in. thick, is placed in the trench and smoothed off to form the bed of the culvert, with a grade of about 1 in. to 5 ft. Empty salt barrels are placed on this bed of concrete, end to end, allowing the heads of the barrels to remain in and the open end being supported with a piece of board to prevent crushing under the load. The concrete is placed in and well tamped at the sides, filling up all the space and 6 in. over the tops of the barrels. The culvert should be at least 6 in. below the grade of the road and after the concrete is set, dirt is filled in to make the grade level. The concrete consists of a mixture of 1 part cement and 7 parts sand and gravel. The heads of the barrels and board props can be removed with a long pole. The staves need not be removed, as they will drop out in time.

Air Chamber Prevents Tank from Bursting

Cracking, and possible ruin of concrete watering trough by freezing, was prevented on a ranch by the simple dodge of anchoring an empty 5-gal. can to the bottom of the tank. The can, which was square, was made air-tight by screwing the cap down tightly against a rubber gasket, and was then anchored to the bottom by a rock. As the can was kept well below the surface of the water, the pressure of the freezing water against the sides of the tank was in a large measure prevented by the collapse of the sides of the can.—Dale R. Van Horn, Lincoln, Nebraska.

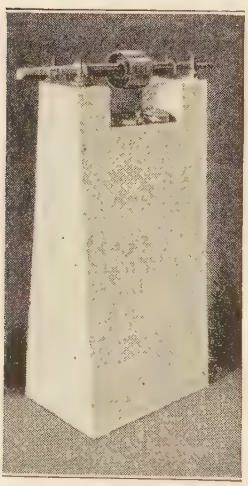
Concrete Foundations for Engines

The concrete used in making foundations for engines that run without much vibration should be mixed in the proportion of 1 part cement, 2 parts clean, coarse sand, well graded from the finer particles to those just passing through a ¼-in. screen, and 4 parts clean, hard pebbles, or hard crushed stone, ranging from ¼ in. to 2 in. in size.

Foundations for all engines that produce considerable vibration should be made of concrete mixed in the proportion of 1 part cement, 1½ parts sand, and 3 parts pebbles or stone, the sand and stone being graded as above. Care should be taken to mix the concrete thoroughly with sufficient water to make it of a quaky consistency, and to deposit the concrete in such a manner that a dense and compact mass will result.

Concrete Support for Emery Grinder

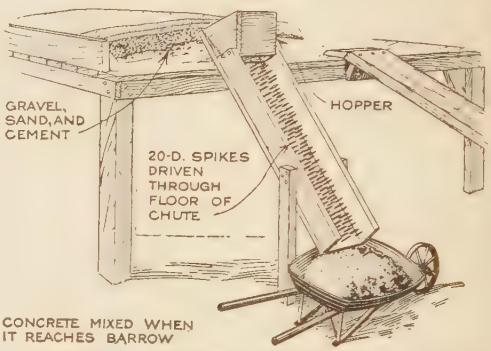
When an emery grinder is to remain permanently in one location, it can be mounted to advantage on a concrete standard, as shown in the photograph. The support shown is sunk 3 ft. below the surface, and is built to a convenient height. Scrap lumber was used for the form, the pieces being cut to fit and held in place by cleats on the outside and nails at the corners; pieces of iron rod and wire-mesh netting were used for reinforcing. The concrete should be mixed to a quaky consistency and should be well tamped down, or worked with long iron rods.



¶A frequent cause of faulty spots in concrete is insufficient mixing. To get first-class results the cement must be mixed thoroughly into the mass by frequent turning. Then all the aggregates become coated with the paste formed by the cement and water and a perfect bond is the result.

Mixing Concrete by Gravity

The sketch shows a self-mixing device without moving parts, which saved a great deal of time for the workmen on a job of concrete construction. A trough, 2 ft. wide, was made of 2-in. lumber, long enough to reach from the mixing platform down to the ground. The trough was heavily braced in position. Through the bottom were driven a number of 20-penny spikes, in rows across the trough, 3 in. apart, the spikes being staggered in a vertical direction. The trough was held at an 80° angle, with the lower end high enough to clear the barrows as they were brought to be filled. On the mixing platform above, sand and gravel were spread out to an even thickness, and on the top of this the cement was dumped from sacks. It also was spread out in a smooth layer, and the materials were then shoveled into the trough. Each shovelful contained all the materials in approximately the right proportions, and they were thoroughly mixed in passing through the trough. The water pipe, not shown in the sketch, was connected to the upper end of the trough, and a valve in it regulated the amount of water which fell with the concrete materials into the barrow.—Dale R. Van Horn, Lincoln, Neb.



By Using a Long Trough, with Spikes Driven through the Bottom, the Concrete is Automatically Mixed

Repairing a Split Lead Pipe with Cement

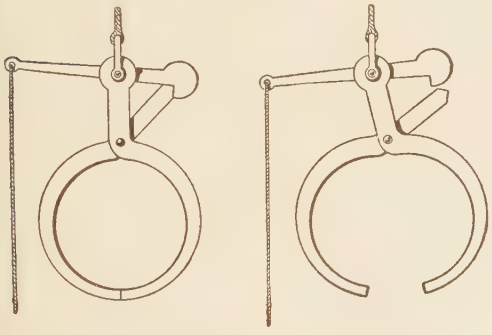
The lead pipe forming the trap under a sink broke or split from pressure of freezing water. As the break, which was 1½ in. long, was in a place difficult to reach, it could not be stopped by soldering. I repaired the break with Portland cement in the following manner: About a half teacupful of dry cement was applied to the break by placing the cement

in a cloth and tying the cloth around the pipe. The leaking water dampened the cement, which set over the opening and closed the break. This made a permanent repair.

After the cement had set the cloth was removed and the hardened cement rounded up and painted.—R. F. Hall, N. Tonawanda, N. Y.

Breaking Up a Thick Concrete Floor

Some improvements being made in a factory necessitated the removal of a concrete floor 1 ft. thick. The work



Release Grip for Dropping the Weight When It is Carried High Enough for a Heavy Blow

could not be accomplished with picks and wedges, so a piece of metal was cast, about 2 ft. in diameter and ½ ft. long, which weighed about 1 ton and was used as a hammer to break up the cement.

A very ingenious release grip was made to use in connection with the overhead traveling crane for lifting the weight, which was carried to a height of from 35 to 50 ft. before it was dropped. The illustration clearly shows the construction of the clamp and how it is tripped when the weight is at the proper height. —J. C. Moore, Wilkinsburg, Pa.

Grease Gun for Applying Cement

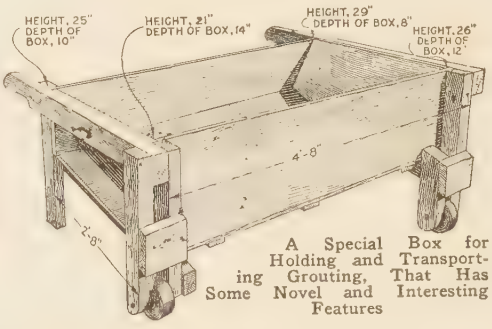
An automobile grease gun was used in amateur building operations by the owner of a house which began to show signs of wear. An ornamental facing block that had fallen from the base of a stone column, was fastened in its former position with cement. Before the cement was applied, a few large nails were thrust between the block and those above and below it, so as to keep them separate, after which the cement was forced into the spaces with the grease gun. When it had dried, the block was firmly fixed.

Protection of Fresh Construction

Regardless of how carefully the materials for any cement work may have been selected, proportioned, mixed and placed, the resulting success or failure must depend largely on whether or not the concrete is protected against too rapid drying out after it is placed. If suitable protection is not afforded, the concrete instead of hardening, simply dries out, as a result of evaporation of a large portion of the mixing water. Cement construction that exposes a large surface area to sun and wind, such as walks, feeding floors, barnyard pavements, etc., must be protected against rapid drying out by a layer of some moisture-retaining material. Sand, sawdust, hay, straw, old canvas, burlap, carpets, or similar covering applied as soon as the concrete surface can be covered without marring it, accomplishes the purpose. Such coverings should be kept wet by frequent sprinkling for from a week to ten days or more, depending upon the nature of the work and the temperature conditions.

An Improved Mixing Box for Mortar or Grouting

In repairing a roadway, the varying levels and the crown from the curb to



A Special Box for Holding and Transporting Grouting, That Has Some Novel and Interesting Features

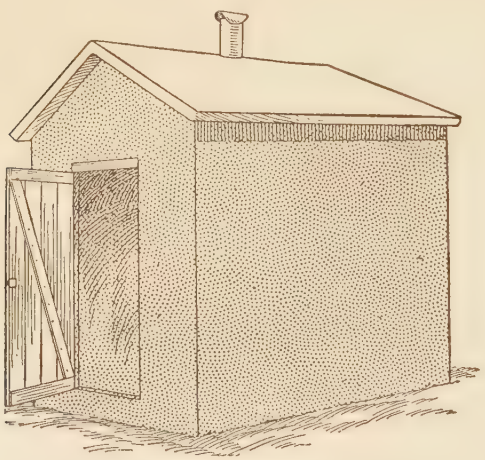
the center made it awkward to use a box of the ordinary construction, mounted on wheels, for mixing the grouting and moving it from place to place. When the box was nearly full, the varying level of the material caused splashing and spilling. A special mixing box was therefore constructed, the principle of which can be adapted to mixing boxes for various uses. The mixing trough was constructed so that the mixture flowed to one corner, which was the deepest. The top of the box was so arranged by varying the

height at the four corners, that it was level in spite of the curve of the roadway when the box was transported, the back end being raised.—J. E. Cahill, Jr., New York, N. Y.

To Build a Reinforced-Concrete Smokehouse

Many people continue the practice of smoking and preserving meats on their own premises, preferring the appetizing results of the old way to the modern chemically treated product, says Concrete-Cement Age. And when it comes to ways and means to insure the best results, concrete as usual takes first place. A smokehouse should retain the required quantity of smoke, exclude flies and other vermin and should be fireproof. A building of concrete has all these good qualities as well as being thief-proof.

In constructing such a house ordinary lumber may be used for forms. The walls for a 5-ft. by 8-ft. building should be 4½ in. thick and rest on a foundation, 8 in. wide and 2½ ft. deep. The roof and floor should be 3½ in. thick. The inside form is made first, then the outside erected, layer by layer as the concrete is placed, thus avoiding much heavy lifting and giving perfect control of the reinforcement. The wall reinforcement consists of ⅜-in. rods, 8 in. long, spaced 18 in. in either direction. Similar rods, laid flat in the concrete, and upon the inside and against the other rods, are carried around the building, being



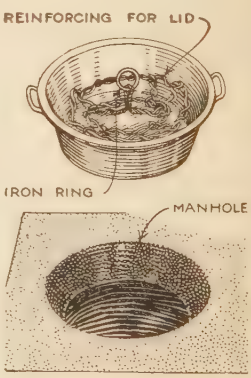
A Thief and Vermin-Proof Smokehouse Built of Reinforced Concrete Throughout: The Construction Is Very Simple

bent around the corners and hooked together where they meet, thus making a very secure job. In constructing the roof, nail 2 by 4-in. rafters to the uprights of the inside forms, placing them 1 in. below the bottom of the concrete roof, the pitch being 1½ ft. The rafters are sheathed with 1-in. boards and the work of laying the concrete begins at the cornice. The boards and studs must not be too close-fitting, to avoid damage from the swelling of the lumber by dampness, although the cement must not leak through, as this weakens the structure.

The amount of material necessary to construct a house of the dimensions given would be approximately 10 bbl. of cement, 3 cu. yd. of sand, 6 cu. yd. of crushed rock or screened gravel, and 55 pieces of ⅜-in. rods, 8 ft. long. Heavy woven wire could be used for reinforcing the walls and for the long way of the roof.

Dishpan Makes Concrete Manhole Form

An easy way to form the manhole for a concrete cistern top, or septic tank, is to use an old dishpan of the desired size. This is set in the regular form, and the outside gives the shape to the opening. The cover is then made by pouring concrete inside the pan up to the level of that outside, thus giving the proper bevel and insuring a fit.



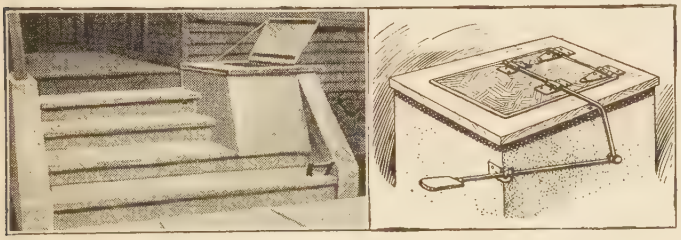
Twisted wire, or a round piece of woven-wire fencing, can be used for reinforcing the cover or lid. A rod, or ring, should be put in and tied to the reinforcing for a handle.—M. W. Lowry, Athens, Ga.

Small Drains in Concrete Made with Pipes

Where it is necessary to make drainage grooves in concrete before it has become hardened, a neat groove of uniform size and shape may be provided by using a length of iron pipe of the proper diameter as a form. The pipe is partly imbedded, and removed carefully. If it is necessary to refinish the groove, a short section of pipe, smoothed to a polish and rounded up at the ends, makes a good improvised surfacer.

Concrete Holder for the Waste Pail

The waste-pail holder shown in the illustration is a great convenience; it provides a neat and sanitary container in which the pail is out of sight and away from flies, yet in a position easily accessible.



A Concrete Box Incorporated in the Rear Steps, near the Kitchen Door, Provides a Clean and Sanitary Container for the Waste Pail. It Keeps the Flies Away from the Garbage, and can be Flushed Out Often

The construction of the holder is simple; it is made of concrete, large enough to contain two pails, and is incorporated with the concrete steps as shown. By slanting the bottom toward one side, and setting a 1-in. pipe through the wall, a drain is provided to carry off the water when cleaning the inside. In order to attach the cover securely to the concrete, bolts are set in the form before pouring. To these bolts is attached the wooden frame that holds the cover. The frame is cut to project about 1 in. over the outer edges of the container, but is flush with the inner edges. The cover is made of the heaviest galvanized sheet iron obtainable; it is cut about 1 in. larger than the inside opening of the wooden frame, and hinged to it as shown. If extra-heavy sheet metal is not available, light stuff can be used, providing the edges are rolled around wire, or strips of flat iron are riveted to the edges, to make the cover rigid. A knob is fitted on the cover to facilitate lifting it, and a small chain is fastened between the wooden frame and inside of the cover, to prevent the cover from falling back entirely. If desired, a foot lever can be arranged as shown in the drawing. This is convenient, as it enables one to lift the cover without stooping.

Protecting Steel Work with Cement Paste

The most efficient, durable, and economical coating for steel girders, in viaducts or overhead crossings, to protect the steel from the corrosive action of locomotive gases is a cement paste mixed in proportion of 12 lb. pure red lead, 32 lb. Portland cement, 4 lb. linseed oil, and 2 lb. drier. This mixture should make a paste like putty, and if too soft, cement and red lead are to be added; and if too heavy, oil and drier are to be added. The iron or steel surface to be coated should be as clean of rust and foreign matter as it can be made, using either the sand-blast, steel brush, chisel, or sandpaper, for this purpose, according to the amount and hardness of the foreign matter to be removed. Apply one heavy coat of red lead and allow the same to set. Apply one heavy coat of Japan drier. Put the paste on this drier while it is wet. Do not allow the drier to become dry before applying the paste. The paste should be put on about ⅛ in. thick, rubbed with a trowel and pressed around rivet heads and angle flanges by hand. Cover over the paste with one coat of red lead. This last coat retards the hardening effect of the atmosphere.

Cement-Floor Covering to Prevent Dust

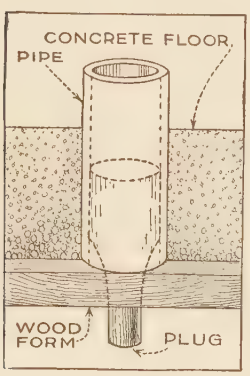
If it is desired to make a concrete floor in a factory or mill that will not sand off or make dust, a coating for the purpose can be prepared when making the floor. This coating consists of one part cement to two parts crushed rock or hard gravel that will pass through a ½-in. sieve, and from which the fine dust has been removed. This is thoroughly mixed in a mixing box, or by a machine mixer, with a sufficient amount of water to produce a plastic but not sloppy consistency, and spread on the under concrete before either the finish or the under concrete has had time to set. It is floated with a wood float to a true level, and then slightly troweled with a steel trowel, to bring it to a proper level and to smooth the top slightly. This will give a finish which is pebbly, and not dead smooth or "slick" like a sand finish. After the finish has been troweled and has set sufficiently so that the covering will not mar the surface, it should be covered with sawdust, sand, cloths, burlap, old carpet, or any other material which will hold water continuously. The finish should be kept soaking wet for at least a week, or, better, for 10 days.

Hoisting with a Concrete Mixer

The problem of getting material out of an excavation for a reinforced-concrete job was solved in an unusual way by one contractor. The electrically driven concrete mixer was rigged so that it would do the lifting of the earth from the excavation. The mixer, which was of the cylindrical type, had a rope, leading out of the hole and fastened to the drum, after passing over a set of sheaves. To hoist, the motor was run and the rope wound up on the drum of the mixer. For lowering, the weight of the empty bucket was usually sufficient and when it was not, or a braking action was required, the motor was reversed.—Sidney K. Eastwood, Germantown, Pa.

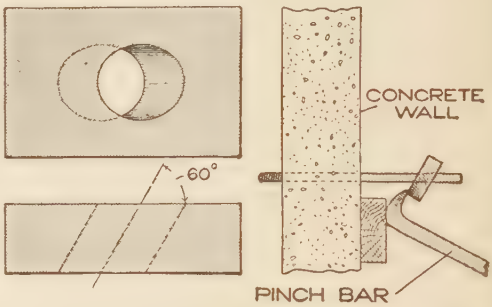
Setting Pipe in Concrete

In the construction of a reinforced-concrete and steel factory building, it was specified that, wherever conduit or other pipe was to pass through a floor, a short piece of pipe having an internal diameter large enough to accommodate the conduit or pipe, should be set. The short pieces of pipe were to be flush with the ceiling on the underside and project about 2 in. beyond the floor above. In most locations, it was difficult to secure these short lengths of pipe so that they would stay exactly where they were placed, and in the majority of cases, it was found that, after the concrete had set, and the forms had been removed, the sleeves had shifted a little, or had risen enough to allow the semiliquid concrete to enter and partly fill the pipe. After a number of faults of this kind had been discovered, the method illustrated was devised and used with excellent results. A block of wood was neatly rounded to slip inside one of the pipes, the other end of the plug being whittled down to fit into an auger hole drilled through the wooden form. A hammer and smaller piece of pipe were used to drive the plug into the hole tightly. It was found that the pipes set in this manner stayed in the exact position in which they were placed.—Leon D. Quick, Milesburg, Pa.



Puller for Concrete-Form Bolts

The action of the puller is the same as that of the lever jack. The holding device is made of a steel plate, 3 in. square and ½ in. thick. A hole is drilled near the center on an angle of 60° to the surface. It is only for use with headless bolts such as are commonly used for concrete-wall forms. With this style of bolt a collar and setscrew takes the place of the head. A pinch bar is used in connection with the piece of steel, as shown.



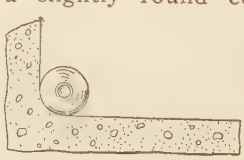
The Oblique Hole in the Steel Block Forms a Grip Like a Lever Jack, and Enables Bolts to be Pulled Easily from Forms

Removing Stains from Concrete

Concrete and stucco houses are often discolored by stains, caused by dirty water dripping from window sills and cornices. These stains can be readily removed by scrubbing with water, using a heavy bristle or wire brush. Rust stains can be removed by scrubbing the spots with a solution of 1 part muriatic acid and 5 parts water. When using this, the hands should be well protected from the acid, as it is very strong, and will cause severe burns. After scrubbing the concrete, the acid must be well rinsed off with clean water.

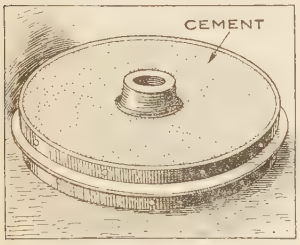
Concrete Form to Make Round Inside Corners

To avoid sharp angles where a concrete floor joins a wall, it is best to make a slightly round corner. A bottle of the desired radius makes a good form for this work, as the cement will not stick to the glass and the surface of the concrete will be left smooth.—N. M. Baldwin, New London, Conn.



Increasing Weight of Tractor Front End

My first experience with a tractor was in the days when the designs were created more by guess than by practical experience, and my first tractor would act more like a balky horse than most of the present-day tractors do. Not that it refused to go so often, but when it was overloaded, it tried to turn a back somersault. I decided to break it of this habit, and found that I could do so by filling the front wheels with cement. To do this, the wheels were removed, and placed over a concave depression scooped out of the ground to the form desired, and a place was also provided for the hub to lie in. Then the space between the rim and hub was filled with a mixture of one part cement to four parts sand, and troweled off on top. The extra weight amounted to about 350 lb., and was sufficient to hold the front end down. Making the front wheels solid in this manner not only provided the extra weight required, but made it easier to turn in loose ground and to steer.—G. G. McVicker, North Bend, Neb.



Waterproofing Concrete Work

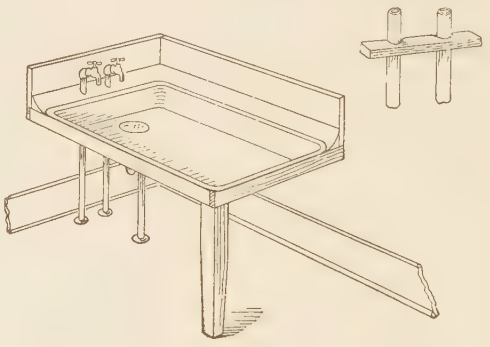
For the purpose of waterproofing concrete there is nothing better than the commercial waterglass, which is a solution of sodium silicate. Dilute the waterglass with four parts of soft water. Apply with a flat brush, thoroughly wetting the surface.

Another method is the use of copper sulphate, also known as blue vitriol. One pound, dissolved in 4 gal. of water and applied the same as the waterglass, will give excellent results. The sulphates of aluminum, zinc, or iron can also be used, but the copper solution is by far the cheapest and most efficient.

Waterglass is the best water-resisting agent, for its combination with the calcium of the cement is a chemical one, forming an insoluble silicate of that element. Incidentally the waterglass may be colored by mineral pigments, thus at the same time forming a waterproof color for concrete.—A. E. Soderlund, New York City.

Setting a Kitchen Sink with Concrete

In removing an old galvanized-iron sink to replace it with a new white-enameled one, it was found that the boards covering the rim had rotted so that they could not be used. A more sanitary plan than replacing the decayed boards with new ones was desired, and as concrete was suggested, we proceeded to carry out the idea with gratifying results. The hot and cold-water pipes were first firmly anchored to the wall behind by means of a board notched out to fit them. Where necessary other light boards were fastened for a form to hold the concrete. The new sink was then set in place over the bare framework and the concrete poured in. The concrete consisted of a rich mixture, using about equal quantities of cement and as fine sand as was possible to obtain. This mixture would smooth up nicely and when worked with the back of a spoon, to form the gentle curve between the splashboard and the inner edge of the sink, and painted, it proved a highly satisfactory job.—Mrs. Paul S. Winter, Greenville, Pennsylvania.



Concrete Filling and Support for a Kitchen Sink That is Sanitary and Rot-Proof, and That can be Made By Any Handyman

Building Concrete Silos

When constructing a silo, the concrete should be well spaded next to the form faces, so that the coarse-pebble aggregate will be worked away from the face, and the sand-cement mortar come in contact with the form surface. If pockets form in the surface as a result of air bubbles, or because some particles of the coarse aggregate were not forced back, they may be "pointed up" with a rich cement mortar, and gone over with a grout paint wherever necessary, while the concrete is still "green."

How to Make a Concrete Settee

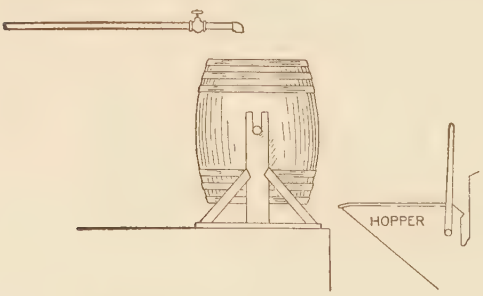
A concrete settee for the summer house, cemetery, or lawn, can easily be made over an old discarded wood settee. The one described was made over an old depot seat, which was 10 ft. long, with a cast-iron frame and wood slats for the back and seat. The seat was cut to make it 6 ft. long. This was done by removing the screws holding the slats and sawing the slats to the proper length, then securely fastening them again.

The back was reinforced with two ⅜-in. rods, crossing it in the form of an X, which were passed through small holes drilled in the casting behind the slats, and drawn up tightly. Similar rods were crossed under the seat. This made the frame very rigid and the whole thing was then covered with expanded metal such as used for stucco houses. This was nailed to the slats and wired to the legs and other metal parts. The entire settee now appeared as if it were made of expanded metal.

A stiff mortar of sand and cement, with about 2 parts of sand to 1 of cement, was applied to the metal lath, care being taken to fill all the openings in the meshes. The mortar was applied until the metal was all covered, then a smooth coat put over it. This made a solid settee that would stand any kind of weather. —W. E. Morey, Chicago.

Water Barrel for a Concrete Mixer

On a concrete job, a water barrel is usually behind the mixer, and the man in charge of the mixing uses a pail to get the water from the barrel to the



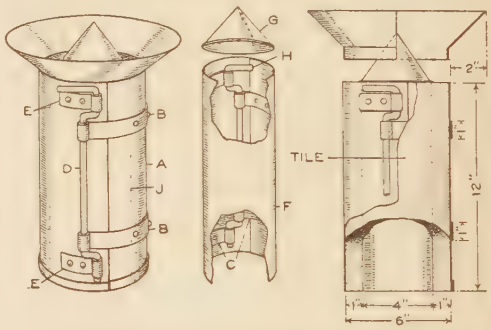
A Very Simple Concrete Mixer, Made from a Water Barrel, Mounted on a Trunnion

mixer, says a correspondent of Cement Age. The accompanying sketch shows the arrangement of a barrel mounted on a trunnion and placed to one side of the mixer. This is filled to a certain height, and when the batch is ready for the water, the barrel can be tilted and emptied easily and quickly. This allows a measured and uniform quantity of water to be added to the mixer in the shortest time possible.

The trunnions could be mounted on a band and the band bolted at any desired height on the barrel. This would allow the easy dumping of any required quantity of water.

A Homemade Concrete-Tile Machine

I built this tile machine for a farmer who made concrete drain tile in his spare time. The machine may be of various



A Farmer Made Concrete Tile for His Land in Spare Time by Means of This Simple Machine

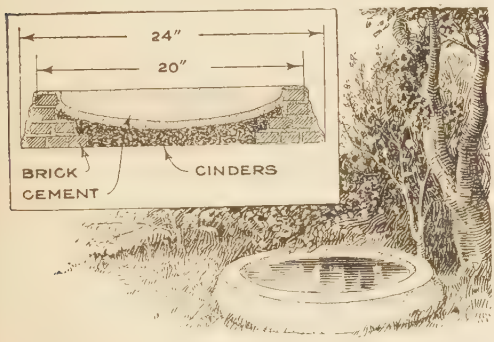
sizes, this one being for tile of 6-in. diameter, 1-in. wall, and 12 in. long. Heavy galvanized sheet iron, 12 by 26 in., was bent to a circular shape, and an internal diameter of 6 in., for the form A. The ends, at J, overlap 2 in. Make two straps B, ⅛ by 1 by 8 in., and bend eyes for the rod D, of ⅜ in. iron. Make two 4-in. pieces, similarly, and rivet both sets to the form A, as shown. Bend the ⅜-in. iron rod D into shape, and fasten it to the bands B and E. Make a hopper for the top, completing the outer form A.

Sheet metal, 14 by 12 in., is used for the inner form F, which is 4 in. in outside diameter. Rivet on, as shown, four straps of iron, C, provided with eyes, for the rod H. This rod is arranged so that, when the end H is set as shown, the outside diameter of the core is 4 in., and when released, becomes less. Make a cap G, as shown; this is used only when filling the mold.

To use the machine, the form A is set on a suitable board, and the core F centered. The latter is then expanded, and the cap and hopper put on. The concrete mixture is tamped in, the core released by the handle H, and removed. The form A is taken off by releasing the rod D, leaving the tile on the board to cure.

Bird Bath of Brick and Cement

Many lovers of wild birds have on their grounds a "wild corner," which is usually planted with native wild shrubs, vines, and flowers. The birds like such surroundings and both the birds and their friends would enjoy it more if a bird bath were provided. There are any number of ideas along this line, but the bird bath built by one admirer of the feathered songsters has the merit of blending well with its surroundings and being economical to make. A circular form of old bricks was made about 14 in. high and 2 ft. in diameter at the base,



The Bird Lover will Find Himself Amply Repaid in the Society and Friendship of His Feathered Pals by Providing Them with Drinking and Bathing Facilities in the Garden

tapering to about 20 in. at the top. The brick form was filled with cinders to within a few inches of the top, leaving a depression which sloped from 5 in. at its deepest point to about ½ in. below the rim. In this way bathing and drinking accommodations are provided for birds of all sizes, from a wren to a flicker. The whole structure was covered with a coat of 1 part cement to 3 parts of clean sand. Both the inside of the basin and the exterior are finished rough, and when completed, the whole has the appearance of a large bowlder that harmonizes well with its surroundings.—Mrs. Lillian S. Loveland, Lincoln, Neb.

Driving Nails in Cement

Cement would be used in many places were it not for the difficulty of driving nails into it so that they will hold. If clean cinders are mixed with the sand and cement, the surface will hold a nail almost as solidly as wood. It is suitable for fence posts; spots in basement walls where nails must be driven can also be made with it.—A. Handelman, Montreal, Que., Canada.

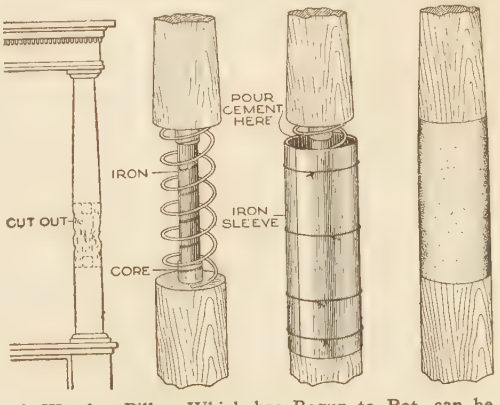
Cement Required for Surfacing

The following table gives the amount of cement and sand required in several instances. From this table one can readily estimate for other areas as may be required.

Bbls. of Cement.	Bbls. of Sand.	Thickness of Coating.	Area Covered in. Sq. Ft.
1	1	1 inch	67
1	1	¾ inch	90
1	1	½ inch	134
1	2	1 inch	104
1	2	¾ inch	139
1	2	½ inch	208
1	3	1 inch	140
1	3	¾ inch	187
1	3	½ inch	280

Repairing a Pillar with Cement

A wooden porch pillar, which has rotted out at one point, may be repaired at a very slight cost, as shown in the sketch. First cut out the rotted portion, leaving projections on both ends at the center of the pillar, as shown. Cut a piece of iron pipe, just long enough to drive in between the two pieces, and wind some stout wire around to act as reinforcement. Then bind a piece of sheet iron around the lower segment, extending up to within about 2 in. of the upper segment, leaving enough space for pouring cement. Line up the top of the sheet iron with the surface of the upper part of the pillar, and pour full of cement. After the cement has dried for about three days, remove the sheet iron,



A Wooden Pillar, Which has Begun to Rot, can be Repaired Quite Satisfactorily by Means of a Piece of Pipe, Covered with Cement

fill the gap with cement, and trim up defects. If the repaired post is repainted, the joints will be scarcely noticeable.—E. Stumpf, Jersey City, N. J.

Fence Wire as Concrete Reinforcement

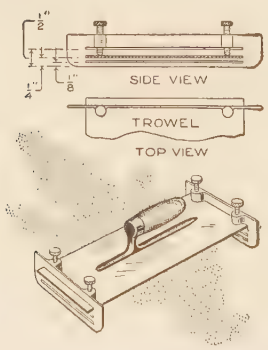
Finding it necessary to provide a safe place for his gasoline and coal-oil tanks, so as not to increase the rate of insurance on adjoining property, a progressive Iowa farmer used woven fence wire for reinforcement in the concrete walls and roof of the structure, and found this to be just as satisfactory as the much more expensive reinforcement that he had used previously in similar work. The strength of the concrete reinforced in this way is shown by the fact that there is not a crack in the roof, although it was made over 15 years ago, and is only 3 in. thick.

A water tank, eight years old, similarly reinforced with a liberal quantity of woven wire and old iron rods, also has proved to be very strong, as not a crack can be seen in it, while other concrete tanks, built later, and not reinforced in this way, are cracked and useless.

The crumbling stone wall of one of the barns was renewed in a similar manner. A trench was dug outside of the old wall, and a form, made of boards, was built, as high as the wall and 3 in. from it. After having inserted three thicknesses of woven wire, on edge, into the form, it was filled with thin concrete. The top of the concrete was then beveled away so as to carry off the rain.—Ed. Henderson, Lake Mills, Ia.

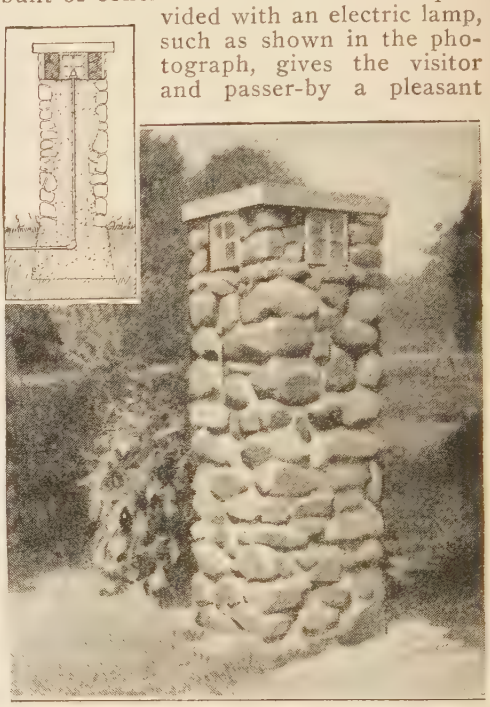
Gauge for Plastering Trowel

Plaster, stucco, cement, and similar finishes applied in layers of uniform thickness, can be applied quickly and easily with a trowel fitted with gauges like the homemade ones shown in the sketch. They are of 1/16-in. sheet iron, and provided with slots to fit the ends of the trowel, so as to make the layer of plaster 1/8, 1/4, or 1/2 in. thick, as desired. The gauges are fastened with knurled screws. After the roughing application is made, the surface of the plaster must be smoothed with a plain trowel to remove the tracks of the gauges.—Alfred J. Miller, Albuquerque, N. M.



An Illuminated Gatepost

A pleasing and substantial gatepost, built of concrete and field stone and provided with an electric lamp, such as shown in the photograph, gives the visitor and passer-by a pleasant impression. The foundation may be either concrete or stone sunk into the ground, with a flare at the bottom as indicated in the insert. When laying the foundation, provision should be made for the pipe conduit through which the wires are led to the light.



An Electrically Illuminated Gatepost of Concrete and Field Stone Provides an Attractive and Substantial Entrance to Public or Residential Premises

In forming the post of concrete, the central part can be poured in an ordinary box form and later faced with masonry, as desired.

Each of the four windows is about 6 in. square. Three of them are of the fixed-sash type, and the other is provided with a hinged door for renewing the bulb as may be necessary. A stone or concrete slab, about 2 in. thick, is used to cap the post, and this overlaps about 1 in. on each side.

The light is controlled by a switch located in the house or at any other convenient point.—Frank W. Harth, Bayside, Long Island.

¶Sprinkling cement work a number of times after setting increases the strength.

How to Make a Cement Coping

In the sketch Fig. 1 shows how to construct a form to make a cement coping on brick walls. Use two 6-in. boards,

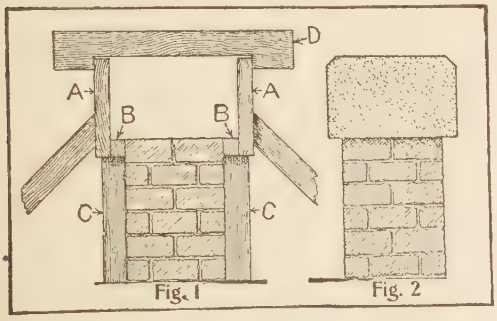


Fig. 1 Shows How the Form for the Coping is Built. Fig. 2 Shows the Coping in Place on the Brick Wall.

AA, and nail on a 1 by 2-in. strip, BB, on the bottom of each to form the projection of the stone. The strips may be of any width to suit the thickness of the coping desired, but 4 in. thick is about right for 8 and 12-in. brick walls. Under the side boards put strips, CC, perpendicular to the ground, to hold the form at the proper height. Brace the form as shown to keep it from spreading when the cement is put in. Short forms will not need bracing, but any form 6 or 8 ft. long should have at least one brace on each side. A board, D, notched just right to fit over the top of the mold, will do for a brace in some places.

After the mold is put in place take some thick cement mortar and stop all cracks where the mold does not fit the bricks. This should be well done so the water will not drip through and deface the brick work. As soon as the mold is ready mix the sand and cement in proportions of 1 part cement and 2 or 3 parts of sand. Mixing 1 part cement and 3 parts sand will make a good job, but 1 part cement and 2 parts sand will be better. Mix the cement and sand dry before putting any water with it.

Put the cement into the mold and with a trowel work it down well along the sides filling the mold completely, and rather quickly. After the mold is full, level the cement off on top and trowel to an even surface. After the cement has set sufficiently to stand without running, then, with a trowel, clip the top corners and smooth them down.

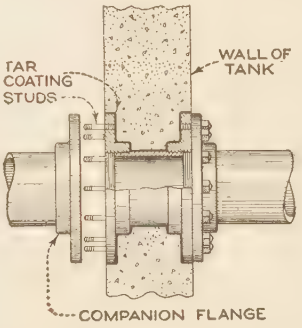
¶Never remove forms until it is certain that the concrete has hardened.

Rodding Concrete Increases Strength

The strength of concrete is much impaired if entrapped air and excess water are not given some artificial means of escape while the material is setting. The process called "rodding" is most effective. An iron rod worked up and down in the mixture makes passages which provide an exit, the operation being repeated until the material is too firm to permit its continuation. Experiments have been made with concrete containing about six sacks of cement per cubic yard mixed with about 10 per cent of water, and the result showed an increase of 100 per cent in strength. A laboratory test was also made, showing that, after seven hours of the treatment, specimens of concrete developed enough strength in 28 days to resist a weight of 4,644 lb. per square inch, whereas exactly similar specimens of the same age, which had not been rodded, could not resist a weight of more than 1,962 pounds.

Water-Tight Pipe Connection for Concrete Tank

For some time, the making of pipe connections in the walls of concrete tanks has proved a troublesome problem, especially if the connection is to be made below water level, where it must be tight. The drawing shows a simple method of making a water-tight joint that can be easily disconnected. Make up a short nipple, with both ends threaded, so that the flanges can be screwed up to be flush with the inner and outer surfaces of the tank. The flanges are equipped with studs, and the flanges and nipple should be coated with tar before assembling. It should be understood that a sleeve of the same diameter as the outside diameter of the nipple used should be placed in the form before the concrete is poured, together with blocks of the same size and shape as the flanges. After the concrete has set, and the nipple and flanges have been screwed in place, companion flanges are bolted in place.

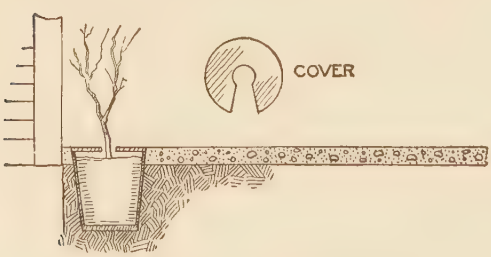


Portland Cement in House Repairs

Buy a sack of Portland cement, keep it in a dry place, and here are some of the many uses you can make of it; in fact, you will soon find it a household necessity, says a correspondent of Concrete. The writer had occasion to repair a wooden cap around a sink, the only defect being around the waterpipe, where the hot and cold water had caused the wooden cap to rot out. After cutting away the defective part, cutting the finished edge under to form a bevel edge or dove-tail, and wetting the surface well, he filled the cavity with neat Portland cement mixed with water to the consistency of putty. Then he worked the mixture into the crevices by pounding lightly on the wooden cap, thus jarring the mixture to the consistency of jelly by bringing the air-bubbles and water contained in the voids of the mixture to the surface. This made a dense close-grain stone when crystallized. He then troweled the surface smooth to a finish. The result was a perfectly water-tight joint around the pipe. The neat cement also adhered to the newly trimmed edges of the woodwork, leaving it neat and clean in appearance. This system of repairing decayed woodwork will be found especially valuable in repairing old wooden buildings, as it can be employed in the renewal of steps, floors, posts, walks, etc., without the necessity of high-priced mechanics and expensive lumber.

Plant Pot in Cement Sidewalk

The pot holding a plant or vine at the entrance of a residence in a crowded



The Pot Being Placed in the Earth Keeps All Dampness Away from the Walk

city is usually in the way, and when the plant is watered the walks become wet. The illustration shows a good, cleanly way of arranging a pot or keg in the walk, so that it is out of sight, and the seeping water will be taken up by the earth. A cover is made as shown.

Reducing Cost of Aggregate

A western roadbuilder has devised a simple attachment for a gravel screen that enables him to get a uniformly fine aggregate from near-by gravel banks,

Blowing the Light Material from Sand and Gravel, as It is Screened, by an Air Blast, to Make It Conform to Certain Specifications

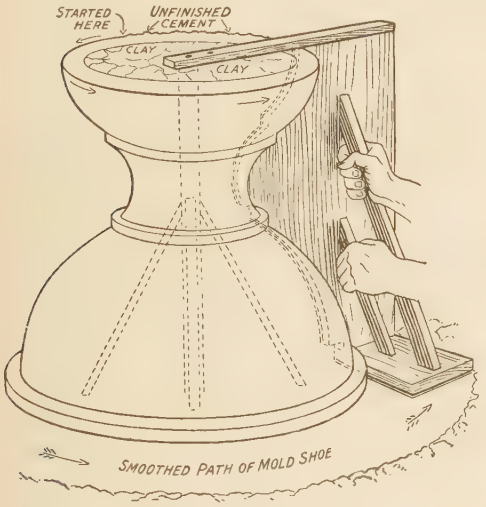
thus saving the cost of transporting a higher-grade material from a distance, as was at first thought necessary. The equipment is so simple that the same idea can doubtless be used in many similar situations.

The apparatus consists of an ordinary bucket conveyor that elevates the sand and gravel to a revolving cylindrical screen, through which the material that will pass through a ¼-in. mesh is discharged into a hopper. This hopper, placed under the screen, collects the screened gravel, and passes it, through a slot, 2 in. wide and 13 in. long, into a bin underneath. As the material pours into the bin in a stream of uniform width and thickness it is met by a blast of air from a centrifugal blower.

The exact amount of fine material that is thus separated from the coarser can be accurately controlled by a pressure regulator. A few tests will demonstrate the proper amount of pressure to use. The gravel must be dry.

How to Make a Concrete Garden Vase

Few people realize that anything of an artistic nature can be made from cement. Concrete is generally looked upon as a material fit for only heavy work and so little seems to be known that it has unlimited possibilities of artistic treatment.



Forming the Concrete Vase

The concrete garden vase as illustrated shows how easily ornamental designs of this nature may be worked out, and such a completed article will cost very little for the materials. A vase of this kind can be made with a half form cut from sheet metal and fastened to a wood base, to which is attached an arm for the radius to describe a circle, and a sliding shoe securely nailed to the bottom.

The first thing to do is to lay out one-half of the design intended for the vase on cardboard, then cut out to the line for your pattern. Lay this pattern on a piece of sheet metal, about 28 gauge, then mark out the design and cut the metal on the mark with tinner's shears. Mark out the same design on a wide board that is 1 or 1¼ in. thick, and cut out the wood with a keyhole saw. Lay the metal on the board, allowing the form side to project over the edge of the wood about ¼ in., and tack all around with 1-in. brads. Bevel off the wood with a wood rasp for clearance, so the sharp edge will be free to cut the cement clean.

Mount the board with the metal face on a bottom board placed at right angles, which is used for a shoe. This shoe should be shod with a piece of sheet metal so it will slide around easily. Two braces are attached to the back of the board and on the top of the shoe.

The arm must be securely fastened to the top edge of the board, and have sufficient length to reach over to the center of the intended size of the vase.

A standard for the center of the vase shown by the dotted lines in the sketch is well braced and staked to the ground where the finished vase is to remain. Clay is made plastic by adding water and then it is built up around the stake in a form near the shape of the finished vase. The arm of the former is now fastened to the top of the center stake with a large wood screw. The hole through the arm should fit the body of the screw a little loosely so the form can be turned easily. Take hold of the braces as shown and push the former around in a circle and cut off the surplus clay. There may be some holes left from the first cutting, which can be filled up and the former run around for a finishing cut. When this is complete, remove the screw and set the former out for a distance equal to the desired thickness of the concrete.

Mix your concrete, making it rather thick and plastic, using 2 parts sand and 1 part cement, and put a coat of this on over the clay form. Take hold of the braces as before and form the concrete the same as you did for the clay, remove the former and give the outside surface two or three thin washes of neat cement. When the cement has set, the clay can be removed and soil put in its place.

In forming vases, bases, columns, etc., always have the largest or heaviest part down. This will make it easy to remove the clay core without the danger of cracking the concrete.—W. A. Lane, El Paso, Tex.

Painting Concrete

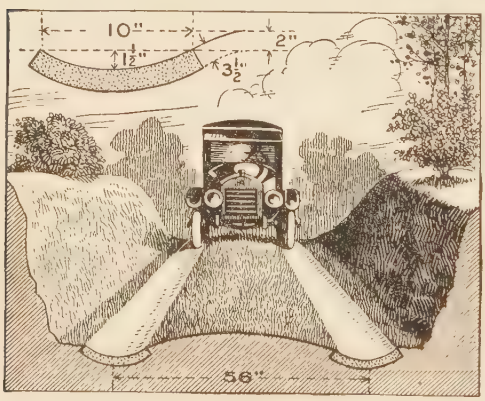
Much difficulty is usually experienced in painting concrete. The alkali acts on the linseed oil chemically and destroys it, while the moisture coming out causes blistering and peeling, just as it does when present in wood. This may be avoided by painting the surface of the concrete with white vitriol, chemically known as zinc sulphate. It is inexpensive and may be purchased at any drug store. Use a 10-per-cent solution; that is, one made of 10 parts of zinc sulphate and 90 parts of water. Apply this solution with a brush and let it dry, after which paint will adhere readily and will not come off.

Lumber Used for Concrete Forms

Contrary to the common practice, in building construction, of using only seasoned and well-dried lumber, green lumber, or that which has been only partly seasoned by air drying, can be used in making forms for concrete work. In fact, unseasoned lumber is preferable for this purpose, as it is not so likely to warp from the moisture absorbed from the concrete. If kiln-dried lumber is used at all for concrete forms, or molds, it should be thoroughly wetted before the concrete is poured. If the forms are made tight, as they should be, the possibility of the kiln-dried forms warping and shrinking will be minimized. Oiling or greasing the inside faces of the forms is recommended, particularly where the forms are to be used repeatedly, as it prevents absorption of water and aids in keeping them in shape when not in use.—George L. Emerson, Chicago, Ill.

Concrete Wheel Ways Serve as Gutters

A plain dirt driveway, cut through a bank, was frequently ruined by washouts. As it was not desired to go to the ex-

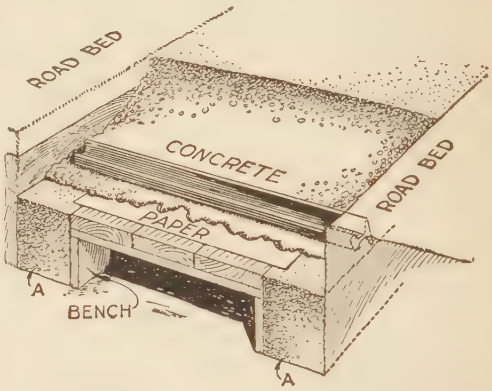


Concave Wheel Ways, That Also Serve as Gutters, Which were Built to Prevent Frequent Washouts That Ruined the Dirt Driveway

pense of building an entire cement driveway, two concave wheel ways, designed also to serve as gutters, were built, and no more trouble from washouts was experienced. These ways were 10 in. wide and about 3½ in. thick, and made of a circular-arc section, with the center about 1½ in. below the edges. The distance between the centers was 56 inches. The ground between the ways was crowned, so that all the water would be shed into them.—O. H. Hampsch, Nashville, Tennessee.

Easily Constructed Concrete Culvert

Our borough construction force builds a very good concrete culvert in the manner shown in the sketch. The sides A are first built, and the forms removed



Simple Method of Making a Concrete Culvert by Using Ordinary Construction for the Forms

before the concrete is completely set. Benchlike wood forms are then placed at intervals between the sides A, and boards laid on them; then paper spread over the surface of the boards. The concrete is then put on top of the paper. Short pieces of railroad iron are laid in the concrete to reinforce it.

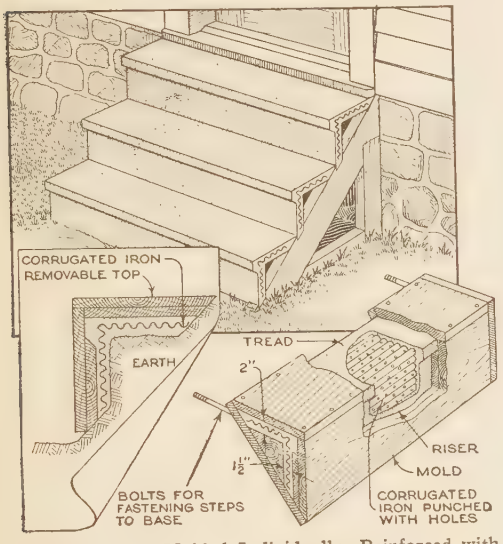
After the top has properly set, the supports are driven out, or broken down with a long iron rod. The boards are then easily withdrawn. This culvert is strong enough to stand the travel of heavy teams as well as automobile trucks. —James M. Kane, Doylestown, Pa.

Cutting Reinforcements in Concrete Structures

Reinforcing in concrete beams, walls, etc., should never be cut if it is possible to avoid it. The reinforcement is inserted in the concrete for the purpose of giving the concrete the necessary tensile strength, and, while there is usually an ample factor of safety used in computing the amount of reinforcing necessary, it is best, when it is necessary to cut through a beam or wall, to have the work supervised by a competent construction engineer, so that the structure may not be weakened beyond the safety mark. Of course, this does not apply to inserts set in the concrete for the purpose of bolting up hangers for line and countershafting, or where the concrete is used as a fireproof coating for solid steel I-beams. —J. Tate, Chicago, Ill.

Steps Reinforced with Corrugated Iron

The type of concrete step shown in the drawing can be molded individually and attached to wooden stringers with bolts



Concrete Steps Molded Individually, Reinforced with Corrugated Sheet Iron and Bolted to Wooden Stringers, Make a Light but Durable Flight of Steps with a Considerable Saving in Cement

to make a light but durable flight of steps. Each step is reinforced with corrugated sheet iron, which is liberally punched with holes and bent at right angles. The L-shaped wooden form is stood on one end, and the concrete poured into the opposite end. Bolts of the proper diameter and length are inserted into the form so that the completed step can be attached to the stringers. The same form can be applied to the molding of steps in a solid unit, only in this case the concrete is poured from the top of the form, which should be made removable. By either method a considerable saving in concrete work is effected, and the finished job is much lighter, but sufficiently substantial for the purpose intended.

How to Make Concrete

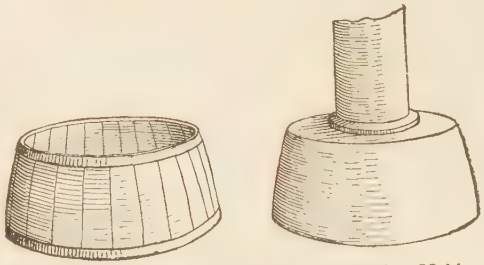
Concrete is made by mixing Portland cement, sand, pebbles or broken stone and water in certain definite proportions according to the kind of work for which the concrete is to be used, and then permitting the mixture to harden under proper conditions in forms or molds. As soon as concrete has been mixed, if left undisturbed, it begins to harden and soon becomes like stone.

Color Test for Cement Sands

A simple color test made in the Structural Materials Research Laboratory, Lewis Institute, Chicago, has shown that organic impurities, of a humus nature, are responsible for the lessening of the strength and durability of concrete made from sand containing silt. The test is made as follows: Fill a 12 oz. graduated prescription bottle to the 4½ oz. mark with the sand to be tested. Add a 3-per cent solution of sodium hydroxide, until the volume of the sand and solution, after shaking, amounts to 7 oz. Shake thoroughly and let stand for 24 hours, and then observe the color of the clear liquid above the sand. If the solution resulting from this treatment has a light yellowish tone, the sand may be considered free from harmful organic impurities. If, however, a dark-orange colored solution is produced, the sand should not be used for high-grade work such as roads, pavements, or building construction. Sands that color the solution a medium dark-brown may be employed for unimportant concrete work. But, and this is most important to remember, the sand that gives a very dark-brown color test should, in no circumstance, be used for making concrete.

Round Concrete Column Base Forms

A very cheap and quickly made form for making bases for columns is a barrel or keg sawed in two in the middle.



Barrel Cut in Half, and Used as Form for Making Bases for Columns

The form and the completed base are shown in the accompanying drawing.—W. A. Jaquythe, Richmond, Cal.

¶A false impression entertained by some is that almost any kind of scrap wire, even barbed fence wire, will serve for reinforcement. Such wire is often so rusty or dirty that concrete will not stick to it and it is therefore useless unless clean.

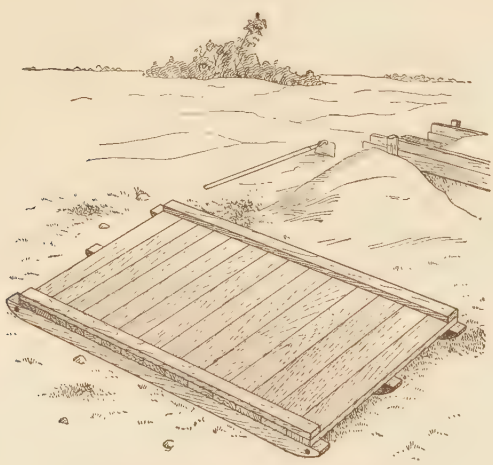
Cement Unaffected by Age

Cement does not deteriorate with age, provided that no hydration occurs, which is only possible through contact with moisture. Occasionally, when cement is stored in high piles for a long time, the lower bags will become compacted; this is known as "storage caking," although often mistaken for caking caused by moisture. The lumps can be easily broken up, and the strength of such cement is in no way impaired, although it usually requires a trifle longer to set or harden than new cement.

Platform for Mixing Concrete

Concrete has become one of the best materials for building construction on the farm, as elsewhere, and knowledge as to its proper mixing is of importance. One of the requisites is a mixing platform, and that shown in the illustration may be made readily. Farmers, or others who prepare concrete from time to time, will be repaid for the making of such a platform.

The materials necessary are three pieces, 12 ft. long and 4 in. square, for the runners; 14 planks, 7 ft. long, 10 in. wide, and 2 in. thick, and two pieces of 2 by 4-in. material, 12 ft. long. It is built on skids so that it may be hauled from place to place. The planks should be surfaced on the upper sides so as to

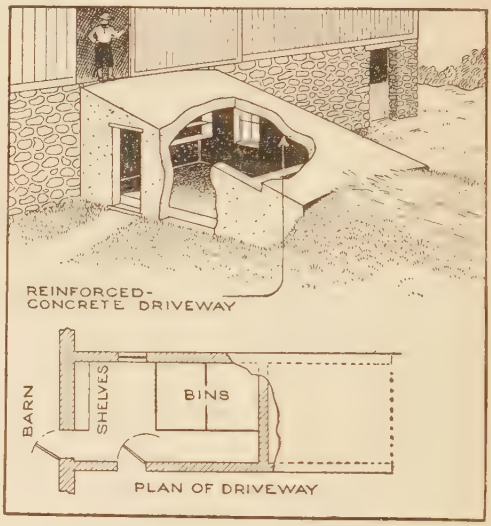


Concrete-Mixing Platform That may be Hauled into Place Readily and That is Constructed in a Substantial Manner

be suited for the shoveling of concrete. Holes are bored in the rounded ends of the skids so that clevises may be attached to them.

Root Cellar under Driveway

Farmers are more and more learning to utilize waste places. One farmer made a very satisfactory root cellar under the



Instead of Filling Up the Space under the Driveway, This Farmer Uses It for Storing Roots

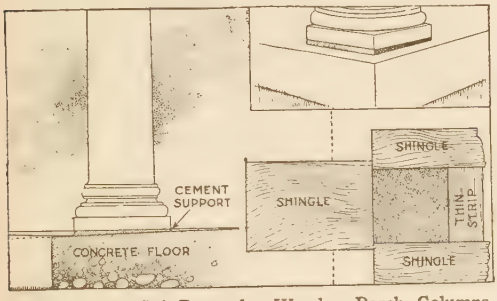
driveway to the second floor of his barn. Since the top must be reasonably thick, and the sides or walls were required for the drive, the only extra cost was that incurred by putting in a window and doorway, and making the roof slightly thicker, to stand up under the strain of the loaded wagons to be driven over it. —Dale R. Van Horn, Lincoln, Neb.

Cement Supports for Porch Columns

Some years ago I built a concrete porch floor in the front of my house, and decided to use columns, turned from wood, to support the roof. I wished to prevent water from getting under the columns and rotting them, but wished also to find some method which did not produce such an unsightly appearance as do the cast iron sub-bases which are ordinarily sold for the purpose.

Accordingly I placed the square wooden bases on the porch floor in exactly the positions they were to occupy later. Since the slant of the floor was practically the same as the taper of a shingle, I placed a shingle on either side of every base with the thick ends in line with the front side. Then I selected some wide shingles, and fastening one with its thick end touching, for a very short distance, the thick ends of the

other two shingles. Next, I fitted a thin strip of wood between these two shingles, at the back side of the base, the thickness of this strip being determined by the thickness of the shingles at this point. When these forms were completed and held in place by weights or other convenient means, the wood bases were carefully lifted out. I then made a rich mix-



Thin Cement Sub-Bases for Wooden Porch Columns Permit the Water to Flow Out, and Thus Prevent Rotting of the Columns

ture of cement and sand, and after wetting the floor inside the forms, filled each with cement and leveled the top of the shingles and the thin strip. As soon as the cement had dried slightly, I removed the forms and left it to harden.

The next day the columns were erected. They have stood for a long time. The wood shows no signs of decay, though the floor is in a place entirely exposed to the weather. These concrete bases were sufficiently high to prevent water running under the wood; they were cheap, inconspicuous, and durable.—Arthur J. Dunckel, Dolgeville, N. Y.

Cement Concrete Vats and Tanks

Impervious, odorless, tasteless, and sanitary vats and tanks for buttermilk, wine, oil, pickles, sauerkraut, etc., can be constructed of reinforced concrete, the reinforcing to be designed by a competent engineer, provided the interior surfaces are treated as follows:

After the forms are removed, grind off with a carborundum stone any projections due to the concrete seeping through the joints between the boards. Keep the surface damp for two weeks from the placing of the concrete. Wash the surface thoroughly and allow to dry. Mix up a solution of 1 part water glass (sodium silicate), 40° Baume, with 4 to 6 parts water, total 5 to 7 parts, according to the density of the concrete surface treated. The denser the surface the weaker should be the solution.

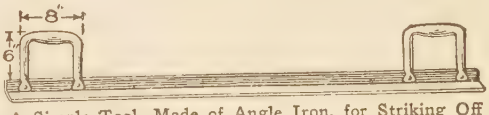
Apply the water-glass solution with a brush. After four hours, and within 24 hours, wash off the surface with clear water. Again allow the surface to dry. When dry, apply another coat of the water-glass solution. After 4 hours and within 24 hours, again wash off the surface with clear water and allow to dry. Repeat this process for three or four coats, which should be sufficient to close up all the pores.

The water glass which has penetrated the pores has come in contact with the alkali in the cement and concrete and formed into an insoluble hard material, causing the surface to become very hard to a depth of ⅛ to ½ in., according to the density of the concrete. The excess sodium silicate which has remained on the surface, not having come in contact with the alkali, is soluble, therefore easily washed off with water. The reason for washing off the surface between each coat and allowing the surface to dry is to obtain a more thorough penetration of the sodium silicate.

It is obvious that concrete surfaces so treated, if hard, impervious, and insoluble, are thus made tasteless, odorless and sanitary also.

Strike-Off Tool for Cement Workers

A tool for striking off the surface of cement in sidewalk construction is very important. Such a tool can be made by any blacksmith. The illustration shows a tool which was designed by a correspondent of the Cement World. It is simply a piece of 1½-in. angle iron, 6 in. or more longer than the width of



A Simple Tool, Made of Angle Iron, for Striking Off the Surface of Concrete Sidewalks

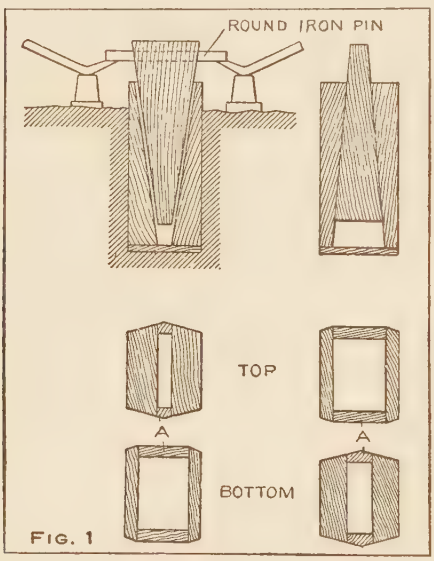
the sidewalk on which it is to be used, with a large handle on each end. The handles are of ¾-in. round iron, with ends flattened and riveted to the inside of the angle.

To use the strike-off tool, a workman at each end grasps it by the handle, each handle being convenient for holding with two hands, and the surface of the top coat is cut off neat and clean with a sort of sawing motion. Each man in turn pushes his end slightly forward so as to keep the surplus material on the walk ahead of them. When this accumulates, it may be removed with a shovel.

If a little care and judgment are used in the striking-off process, it saves a large part of the work of finishing and greatly improves the quality of the work.

Making Holes for Bolts in Concrete Engine Foundations

When building concrete engine foundations it is necessary to leave holes of considerable size for the holding-down



Collapsible Forms for Making Holes for Holding-Down Bolts in Engine and Heavy-Machinery Foundations

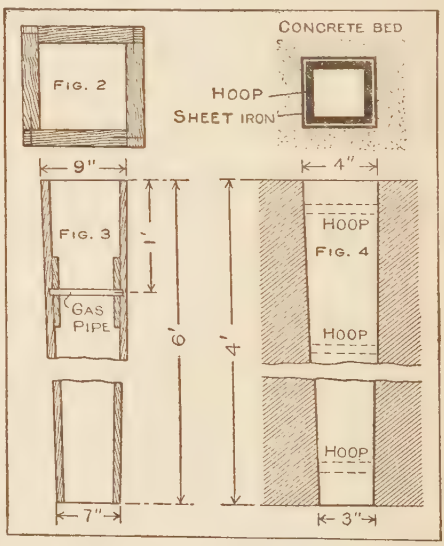
bolts, these holes to be afterward filled up when the bolts are in place. Wood boxes are often used to form the holes, and these have to be withdrawn after the concrete of the foundation is set. The boxes must be removed from the concrete in some way, either by breaking them in, or drawing on a taper, says Practical Engineer. A taper form is made of solid pieces, with a center wedge, which may be either drawn out or knocked down in and the whole structure withdrawn from the hole as shown in Fig. 1. This form is used soaked with water, and shrinks as the concrete dries out. The wedge faces are well coated with tallow and graphite and pieces A are made thin and broken out before withdrawal of the pieces of the former.

Another suggestion is to wrap the boxes with two thicknesses of oiled paper so that the concrete cannot touch the wood. The boxes will then come free, leaving the paper wrapping, which can be dug out.

Still another form is that shown in Fig. 2, the box being nailed as lightly as will serve to hold it during the building of the foundation. If the depth is over 4 ft. it is better to taper the box slightly. In removing, a long bar is forced down between the concrete and one side of the box, splitting that side, when the other three sides can be taken out whole. The outer surfaces of the boxes should be well rubbed with soft soap. If the concrete be loosely packed around the boxes instead of ramming hard, it will have a rough surface, which gives a better grip for the grouting.

In metal boxes a piece of steam pipe may be used, with the top end screwed and fitted with a flange to give a pry for a lever. By rapping with a hammer and then pouring water around the pipe it will come out easily. Sheet iron may be used by cutting it taper 1 in. in 4 ft. and holding it out in place by frames put inside the sheets, as shown in Fig. 4. These frames are pulled out with a hooked rod after the concrete is set, and the sides will then come free.

One ingenious device is the building into the box of a piece of gas pipe, to which a hook can be attached for withdrawing, as shown in Fig. 3. This, with



Figs. 2 and 3 Show a Form One Side of Which is Split to Withdraw; Fig. 4, the Method of Making Metal Boxes

a taper box well oiled and shaken sidewise slightly before the concrete sets, makes an easy job.

¶Cement driveways are attractive as well as permanent.